



# Mount Rainier

National Park • Washington



Final General Management Plan  
Environmental Impact Statement

**Final  
General Management Plan  
Environmental Impact Statement**

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National Park • Washington**



IN REPLY REFER TO:

# United States Department of the Interior

NATIONAL PARK SERVICE

MOUNT RAINIER NATIONAL PARK

Tahoma Woods, Star Route  
Ashford, Washington 98304

Dear Friends,

In 1916, the United States Congress spoke to the purpose of the National Park System. It was

*“to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for future generations” (16 USC 1a1).*

When that was written, Mount Rainier National Park had already been protected as a national park for 17 years, and now, 102 years later, we are just as dedicated to this fundamental purpose. It is fair to say that in the past 100 years, Americans have cared deeply about Mount Rainier and have helped the National Park Service live up to this mandate of 1916. Now, after nearly six years of numerous public meetings, letters, e-mails, and informal discussions, the planning of Mount Rainier's future is ready for release. With your assistance, we have exhaustively analyzed and debated the variety of options, opinions, and alternatives for managing the resources and experience at Mount Rainier in the *Draft General Management Plan / Environmental Impact Statement*. Your insights and deep knowledge of the park and its special places have been absolutely essential in refining the *Final General Management Plan*. Your willingness to come out to a public meeting, write letters, and speak out are all testimony to your interest and commitment to the future of this park. The debate was always respectful, without rancor, and inspirational to the planning team.

The normal life of a general management plan is 20 years, and within that same time frame a new generation will move from birth to voting age. They inherit the responsibility for this amazing park and will get the chance to comment on its future when the next general management planning cycle begins.

This *Final General Management Plan* has been modified on the basis of the comments received. Every comment was considered carefully, and its merits and opportunities discussed in detail. We have tried to accommodate the changes when we could, and when we could not, we have stated why. With your help, we will soon move to the implementation of the proposals in the final management plan. Funding of those proposals, as well as funding to maintain what we have today, is a continuing concern, but with the active support of the American people, I feel assured that the park resources and your enjoyment of Mount Rainier National Park will be “unimpaired for future generations.”

Thank you again for your input and your participation.

Jonathan B. Jarvis, Superintendent

**Final General Management Plan  
Environmental Impact Statement**

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**Mount Rainier National Park**

Pierce and Lewis Counties, Washington

The National Park Service (NPS) developed this *Final General Management Plan / Environmental Impact Statement* to provide guidance on the management of Mount Rainier National Park over the next 20 years. The plan presents and analyzes three alternatives for the long-range preservation of natural and cultural resources and for the types and quality of visitor experiences that should be achieved and maintained within the 235,625-acre park. The plan establishes a framework for monitoring resource conditions and visitor experiences relative to defined, long-term goals.

The no-action alternative (alternative 1) would continue to apply the current management program. It establishes a basis for comparing the effects of the other alternatives. The preferred alternative (alternative 2) would provide a range of high-quality visitor opportunities and improved facilities while ensuring natural and cultural resource protection. Alternative 3 would offer a different combination of visitor opportunities than those offered in the preferred alternative. Resource preservation would remain a key management mandate.

This document evaluates the effects of the alternatives on natural and cultural resources, geologic hazards, visitor experiences, and the socioeconomic environment. Compared to the no-action alternative, the preferred alternative would result in substantial beneficial effects on visitor experiences, especially the quality of wilderness experiences and reduced automobile congestion in popular visitor-use areas. This would be achieved in part by establishing a carrying capacity and monitoring program for long-term resource preservation. Many visitors in nonwilderness areas would perceive a benefit from reduced congestion and delays at popular destinations during peak-use periods. Some visitors accustomed to using private vehicles at their convenience during peak-use periods would be adversely affected by limitations on overflow parking and the need to use shuttles. Changes in private vehicle parking facilities would only go into effect after a visitor shuttle system was in place and ready to provide visitor service.

Compared to the no-action alternative, both the preferred alternative and alternative 3 would improve the quality of many visitors' experiences in the park, and better protect natural and cultural resources in popular wilderness and nonwilderness areas. Both alternatives would benefit visitors by offering new opportunities, and by reducing congestion and crowding at facilities. But both alternatives would also restrict the choices of visitors to go when and where they want during the peak-use period, which would negatively affect some visitors. Both the preferred alternative and alternative 3 would result in positive and negative effects on resources in localized areas, although alternative 3 would have a relatively higher potential for negative resource effects in localized areas such as the Westside Road.

For questions regarding this plan, contact Mr. Eric Walkinshaw, Chief of Planning, Mount Rainier National Park, Tahoma Woods, Star Route, Ashford, WA 98304-9751 (360-589-2211 ext. 2332) or Mr. Larry Beal, Project Manager, Denver Service Center, P.O. Box 25287, Denver, CO 80225-0287 (303-969-2545).

## HOW THIS DOCUMENT IS ORGANIZED

This document has five main chapters. The “**Purpose and Need for the Action**” chapter explains why the plan is necessary and what the plan will accomplish. It provides background information about Mount Rainier National Park and describes the park’s purposes, significance, and mission goals. In addition, the “Purpose and Need for the Action” briefly describes the planning process and identifies the major issues and concerns this plan focuses on. It also describes the policies, directions, and strategies of the National Park Service that have guided, and continue to guide, the management of Mount Rainier National Park.

The “**Alternatives, including the Preferred Alternative**” chapter presents three alternatives for managing Mount Rainier National Park. It also describes mitigating measures that would be taken under each alternative to reduce the intensity of impacts and other alternatives or actions that were considered but not analyzed in detail. This chapter concludes with two tables that present a summary of the alternatives and a summary of their impacts.

The third chapter is the “**Affected Environment**,” which describes selected natural, geologic, and cultural resources of the park and visitor experiences and uses. This chapter also describes the socioeconomic conditions in the region surrounding Mount Rainier National Park. Information in this chapter provides the context for analyzing the impacts of the management alternatives.

The “**Environmental Consequences**” chapter describes the effects each alternative would have on key park resources, visitor experiences and uses, and the socioeconomic environment in the region.

The fifth chapter, “**Consultation and Coordination**,” describes the process the planning team used to involve the public and to consult with other agencies during the development of this plan. This chapter also includes a summary of the major changes that were made to the draft document, contains copies of letters received from governmental agencies, tribes, and organizations, summarizes oral and written comments on the draft plan, and provides responses to substantive comments on the draft plan.

The appendixes provide supporting information. This includes legislation related to Mount Rainier, a description of other planning efforts in the vicinity of Mount Rainier National Park that could be affected by this general management plan, detailed definitions of the management zones, examples of potential carrying capacity indicators and standards, an evaluation of how the proposed Carbon River boundary adjustment meets NPS criteria for boundary adjustments, information on consultation with other agencies, and a draft statement of floodplain findings. The personnel responsible for preparing this document are also included here.

## SUMMARY

The National Park Service (NPS) developed this *Final General Management Plan / Environmental Impact Statement* to provide guidance on the management of Mount Rainier National Park over the next 20 years. The plan presents and analyzes three alternatives to ensure that the park's natural and cultural resources would be preserved and to provide for a high-quality visitor experiences within the 235,625-acre park. The plan would establish a basis for decision-making in accordance with defined, long-term goals. It also would institute a carrying capacity framework that would measure and monitor resource conditions and visitor experiences and implement management actions to protect their quality.

### PURPOSE AND NEED FOR A GENERAL MANAGEMENT PLAN

The approved general management plan would fulfill the following purposes:

- identify desired future conditions for park resources and provide direction for natural and cultural resource management, interpretation and education, visitor experiences and services, and other programs
- establish a visitor carrying capacity framework for the park based on physical limitations of facilities and on visitor experience and resource indicators and standards
- manage the park to protect and preserve its natural and cultural resources, processes, and values while recognizing their increasing importance in the region, nation, and world
- provide opportunities for visitors to experience and understand the park

environment without impairing its resources

- maintain wilderness values and provide for wilderness experiences

A new plan is needed to resolve issues confronting the park, based on the complex and sometimes conflicting desires of park users and other stakeholders. As its first priority, the National Park Service must ensure that park resources are preserved and high-quality visitor experiences are provided. Within these mandates, this plan addresses major issues such as vehicle congestion; perceived overuse of wilderness; and changes in the park infrastructure, such as flood damage that has resulted in closing Westside Road and periodic closing of Carbon River Road.

### PLANNING PROCESS

This plan represents the results of planning activities, public involvement, and assessments of natural and cultural resource conditions and visitor experiences. This process started in September 1994 with the first public scoping activities. The process revealed that any long-term park management program needs to address several prominent concerns:

- preserving wilderness values and unique natural features
- preserving the National Historic Landmark District, archeological resources, and other important cultural resources
- preserving natural processes and resources, including plants, animals, air, water, and threatened and endangered species
- protecting scenic resources and the natural soundscape

## SUMMARY

- providing opportunities for visitor enjoyment, including the available range and type of activities and experiences
- promoting healthy and safe conditions to protect people from geological hazards, avalanches, pedestrian and vehicle conflicts, and poor air quality
- striving for an efficient level and magnitude of operations
- having potentially beneficial effects on nearby communities

These concerns were expressed as 12 key issues that included wilderness planning issues, nonwilderness planning issues, and planning issues associated with activities outside the boundary. The 12 issues guided the formation of a range of possible management approaches. Each approach was developed, evaluated, modified, and either retained or discarded from further consideration based on its ability to meet the simultaneous demands of protecting resources and meeting visitor's desires for a broad range of high-quality recreation experiences within the park.

In addition, existing park management zones and prescriptions were evaluated to determine their effectiveness in meeting park purposes and mission goals and their ability to accommodate future management. These evaluations suggested that some management zones and zone prescriptions should be modified, and appropriate changes were included in the candidate approaches.

## ALTERNATIVES

The planning process produced three alternatives for long-term park management:

- maintain current management approaches and strategies (alternative 1, the no-action alternative)
- provide additional visitor opportunities and improved facilities, while ensuring natural and cultural resource protection (alternative 2, the preferred alternative of the National Park Service)
- provide a limited number of new and different visitor opportunities beyond alternative 2, while ensuring natural and cultural resource protection (alternative 3, the additional visitor use alternative)

The three park management alternatives are based on maintaining the park's purposes and significance; meeting the NPS' mission, legal mandates, and policies; addressing park issues, public views, visitor use patterns, and park resource conditions; and the ability to be implemented.

### Alternative 1

Alternative 1, the no-action alternative (continue current management), would continue to manage the park as it has been in the past, relying on existing plans and policies. No major new construction or major changes would occur, except for already approved plans or programs such as repairing Carbon River Road, moving some operational facilities out of Longmire, and constructing a new ranger station and concession facility to replace Sunrise Lodge. All other existing park facilities would be operated and maintained as they have been. No visitor carrying capacity or other new visitor management initiatives would be implemented.

### Alternative 2

Alternative 2, the preferred alternative, is the plan recommended by the National Park Service and is the environmentally preferred alternative. This alternative would provide a range of high-quality visitor experiences and improve stewardship of park resources. The objectives of this alternative would be to

- reduce problems associated with vehicle congestion and vehicle parking
- phase in an alternative visitor transportation system (shuttles) to replace some private vehicle use
- increase the quality and range of opportunities of visitor experiences by reducing congestion, improving infrastructure, and providing information and interpretation facilities inside and outside of the park
- preserve and restore natural and cultural resources by implementing a visitor carrying capacity framework that would include resource monitoring and triggers for management actions
- change some existing management zone boundaries to more effectively achieve the long-term goals established by this alternative
- maintain current management programs, character, and objectives for all other park aspects

A visitor carrying capacity framework for the entire park would be established to preserve and restore natural and cultural resources. The framework would be based on the management zones prescribed by the preferred alternative. Visitor and resource experience indicators and standards would be established for each zone to ensure that resources were protected and that opportunities were provided for quality visitor experiences. Until indicators and standards were established, the number of parking spaces, buses, shuttles, and wilderness campsites would determine how many people could visit the various parts of the park. If conditions were determined to be deteriorating, appropriate management actions would be taken to ensure that resources and visitors' opportunities for high-quality experiences would not be degraded or lost.

Additional opportunities would be provided for summer and winter visitors uses. In summer, this would include several additional picnic sites, better information and interpretation facilities, and a new campground near the Carbon River entrance. Enhanced winter opportunities would be associated with plowing Mowich Lake Road to the Paul Peak trailhead where a new snow-park would be designated. Improvements also would be made to the existing snow-park on State Route 410 at the park boundary.

New information services would be provided both within and outside the park. At Paradise, the Henry M. Jackson Memorial Visitor Center would be replaced with a smaller, more efficient structure. Several multiagency welcome centers would be established outside the park to provide visitors with trip-planning information before they reached the park. In addition, measures such as changeable message signs, information booths at outdoor equipment stores, and daily updates on the Internet regarding the status of popular areas in the park would be used to provide current information on access to park activity areas.

To address parking and congestion problems during peak-use periods, alternative 2 would reduce the total number of parking spaces, relocate some parking areas, and alter traffic patterns in some areas. Shuttles would be phased in to help reduce congestion, free up parking for day-use visitors at popular activity areas, and provide additional opportunities for visitors to enjoy the park.

All overflow parking, including parking on road shoulders and in spaces outside designated parking areas, would be eliminated. Shuttle services would be established concurrently with eliminating overflow parking. To ensure that an effective visitor transportation system would be available when limitations on private vehicle use went into effect, limits on parking would not occur until after a shuttle system was operational.

A transportation implementation plan would be prepared to examine different options for improving transportation in the park. This plan would focus on the operation of shuttles in the park, including incentives to encourage visitors to use the shuttles. The shuttles would be phased in over time and would serve different locations in the park, including the Westside Road, Mowich Lake, Sunrise, and Carbon River in the summer, and Longmire and Paradise in the summer and winter. After overflow parking was eliminated, shuttles would be the only means of visitor access to Sunrise when the parking lots were full. Shuttle service to Paradise would be established in cooperation with communities and regional authorities.

Two changes would be made at Paradise. On a trial basis, the flow of traffic would be reversed on the Paradise Valley Road in the summer to determine if this improves the visitor experience. The Paradise parking area also would be reconfigured to improve efficiency while ensuring compatibility with the National Historic Landmark District.

To reduce sediment runoff into nearby waters, vehicles would not be allowed closer than 0.5 mile to Mowich Lake. Parallel parking spaces for vehicles would be provided along the road's shoulders.

Visitors could continue driving private motor vehicles on the Carbon River Road until a major stretch of road washes out. After that, the road would be closed to private motor vehicles, but hikers and bikers could use the roadbed.

The National Park Service would pursue a boundary adjustment west of the Carbon River entrance. The inclusion of about 1,063 acres in this area would provide for a new campground, picnic area, and support/administrative facilities, and would protect the river corridor.

### **Alternative 3**

Alternative 3 would have many similarities to the preferred alternative. These would include establishing a visitor carrying capacity framework, providing shuttles, coordinating shuttle services with the elimination of overflow parking, improving interpretive facilities, providing information to visitors before they arrived at the park, implementing a boundary adjustment with new facilities near the Carbon River entrance, and establishing several multiagency welcome and information centers.

The Henry M. Jackson Memorial Visitor Center would be rehabilitated to meet minimum code requirements and to improve the visitor experience.

Some of the summertime differences from alternative 2 would include adding parking facilities at Mowich Lake and Paradise. The shuttle system configuration would be similar to that of the preferred alternative, except that there would be no shuttle service to Mowich Lake and along the Westside Road, and the shuttle service to White River and Sunrise would be at a lower level than in the preferred alternative.

Westside Road would be opened to high-clearance private vehicles in the summer.

The last 0.75 mile of the road to Mowich Lake would be surfaced to reduce erosion. Parallel parking spaces would be provided along the road, and the camping area at Mowich Lake would be reconfigured to use the space more efficiently.

During the winter, State Route 410 would be plowed to the White River entrance and State Route 123 would be plowed to the Grove of the Patriarchs. The National Park Service would work with the state to establish snow-parks at both of these sites. In addition, winter visitors would be able to drive high-clearance

vehicles up Westside Road to Tahoma Vista or the snow line.

## ENVIRONMENTAL CONSEQUENCES

Each alternative was evaluated to determine its effects on natural resources, effects related to geologic hazards, and effects on cultural resources, visitor experience, and the socio-economic environment. Both adverse and beneficial impacts were identified. A summary of impacts associated with each alternative is provided in table 8. The most substantial (that is, the major and moderate) impacts are summarized below. If a resource category (such as natural resources or socioeconomic environment) is not discussed, it is because it would not result in major or moderate impacts.

Relatively few major and moderate adverse impacts would be associated with the alternatives. This would occur because the National Park Service is required to avoid, minimize, and mitigate potential project impacts to the greatest extent possible during the planning and implementation processes so that substantial adverse impacts would not occur to park resources and visitor experiences.

### Alternative 1

**Natural Resources.** Most changes to natural resources would result from the expected increase in visitor use of the park over the life of the plan. However, no major, adverse impacts would be anticipated. The alternative would be unlikely to adversely affect special status species or their habitats. Moderate, long-term adverse impacts on vegetation and soils would continue in high use areas from such actions as trampling, soil compaction, and erosion in high-use areas. Minor to moderate adverse impacts on floodplain values would continue in several sections of floodplains.

**Geological Hazards.** Major to negligible long-term adverse impacts would occur as increasing numbers of visitors were exposed to

hazards from volcanic events, rockfalls, and avalanches.

**Cultural Resources.** The alternative would have no substantial or unmitigated adverse effects on the park's cultural resources.

**Visitor Experience.** During summer weekends and holidays, major adverse impacts would occur in the most popular areas (i.e., Paradise, Longmire, and Sunrise) because of traffic congestion, lack of parking, and crowded facilities. In parts of the wilderness area, increased numbers of users could result in minor to moderate adverse effects, particularly near developed areas and trailheads and along popular trails and climbing routes.

### Alternative 2

**Natural Resources.** No major adverse impacts would be expected. The alternative would be unlikely to adversely affect special status species or their habitats. Minor to moderate long-term benefits to vegetation, soil, and wildlife would be expected from implementing the carrying capacity framework and new management zones. A minor to moderate long-term beneficial effect would result from preservation of forest lands through the inclusion of about 1,063 acres of land along the Carbon River within the park boundary.

**Geological Hazards.** As with alternative 1, major to negligible long-term adverse impacts would occur, with increasing numbers of visitors exposed to geological hazards.

**Cultural Resources.** The alternative would have no adverse effects on cultural resources. Long-term beneficial effects on the National Historic Landmark District would result because alternative 2 would limit intrusive development within the district and provide continuity with the district's historic architectural character. Actions that would contribute to the beneficial effects would include the elimination of overflow parking and the redesign of the Paradise parking area and traffic circulation.

**Visitor Experience.** The visitor experience in wilderness areas would have a moderate long-term beneficial effect because the alternative would improve the maintenance of wilderness values and help ensure a quality wilderness experience. In nonwilderness areas, there would be a major to moderate long-term beneficial effect from reduced vehicle and parking congestion and less crowding during peak-use periods. Improved interpretation and information services would provide a major long-term benefit to the quality of the visitor experience. Adverse impacts on the visitor experience would be largely mitigated by providing shuttle services and advance information programs to minimize delays and inconveniences. However, if the Carbon River Road were closed due to a major washout, there would be a moderate to major adverse impact on many visitors' experiences.

### **Alternative 3**

**Natural Resources.** Alternative 3 would have similar effects on natural resources as alternative 2, except that there would be minor to moderate adverse impacts from opening the Westside Road to private motor vehicles. This alternative also would likely have the potential to adversely affect northern spotted owls that might occupy nest sites close to sections of State Route 410 during spring snow-plowing periods.

**Geological Hazards.** As with alternative 1, major to negligible long-term adverse impacts would occur, with increasing numbers of visitors exposed to geological hazards. Unlike the other alternatives, there would be a moderate to major adverse impact due to opening State Route 410 to winter use and increasing the exposure of people to avalanches.

**Cultural Resources.** This alternative would have the same beneficial effects on cultural resources that would occur with alternative 2.

**Visitor Experience.** The effects on visitor experience would not vary substantially from those described for alternative 2.

### **Impairment of Park Resources and Values**

After analyzing the environmental impacts described in the alternatives and public comments received, the National Park Service has determined that none of the actions in the alternatives being considered would result in an impairment to Mount Rainier National Park's resources and values.

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# **Purpose of and Need for the Action**



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## INTRODUCTION

Mount Rainier National Park was recognized as a significant area when the United States Congress established it as the nation's fifth national park in 1899. Subsequent congressional actions included the designation of about 97% of the park's 235,625 acres as wilderness (1988) and the establishment of the Mount Rainier National Historic Landmark District, a 1,700-acre area that encompasses most of the park's historic developed areas (1997). The park's outstanding wilderness values, natural and cultural resources, and remarkable scenic characteristics were and continue to be its signature features.

### PURPOSE OF THE PLAN

The approved general management plan would fulfill the following purposes:

- Identify desired future conditions for park resources and provide direction for natural and cultural resource management, interpretation and education, visitor services, and other programs.
- Identify strategies for resolving issues within the context of regional, national, and global trends.
- Fulfill the requirements of the National Parks and Recreation Act of 1978 (PL 95-625), which requires the National Park Service to prepare and revise general management plans in a timely manner for each unit of the national park system.

### NEED FOR THE PLAN

A new general management plan is needed to address issues and concerns confronting the

park, to ensure that park resources are preserved, and to provide opportunities for a diversity of quality visitor experiences in the 21<sup>st</sup> century. The *Mount Rainier National Park Master Plan* (NPS 1974) was prepared more than a quarter century ago, and did not anticipate several major issues, particularly congestion at Paradise, Sunrise, and other areas. Visitors have also been affected by recent changes in the park infrastructure, such as flood damage that has resulted in the closing of Westside Road and periodic closing of Carbon River Road. An updated plan also is needed to address other issues and concerns associated with changes in land uses and developments external to the park, increased knowledge regarding geologic hazards, and increased regional growth.

The changes in surrounding areas, together with changes in the park and in management approaches being followed by the National Park Service (NPS), have affected park resources and the diversity of experiences offered at Mount Rainier National Park. The specific issues and key decision points for this document are described in more detail in the "Scope of this Document" section in this "Purpose of and Need for the Action."

This *Final General Management Plan / Environmental Impact Statement* includes revisions that were made in the preferred alternative and the other alternatives in response to public comments on the draft document. A minimum of 30 days after this document is published, the National Park Service will select and approve the final plan and publish a record of decision in the *Federal Register*. The plan will then be implemented.

## PLANNING BACKGROUND

### BRIEF DESCRIPTION OF THE PARK AND ITS REGIONAL CONTEXT

Mount Rainier National Park encompasses 235,625 acres in west-central Washington, on the western slope of the Cascade Range. Eighty-three percent (196,181 acres) of the park lies within Pierce County, and 17% (39,444 acres) is in Lewis County. The park's northern boundary is approximately 65 miles southeast of the Seattle-Tacoma metropolitan area and 65 miles west of Yakima (see Vicinity map). The elevations of the park extend from about 1,700 feet above sea level to 14,411 feet at the summit of Mount Rainier.

The focal point of the park is a towering, snow- and ice-covered volcano, which is a prominent landmark in the Pacific Northwest. The base of the volcano spreads over an area of about 100 square miles. The 26 major glaciers on the mountain cover 35 square miles, constituting the largest single-mountain glacial system in the contiguous 48 states. Mount Rainier is also the second most seismically active, and the most hazardous volcano in the Cascade Range.

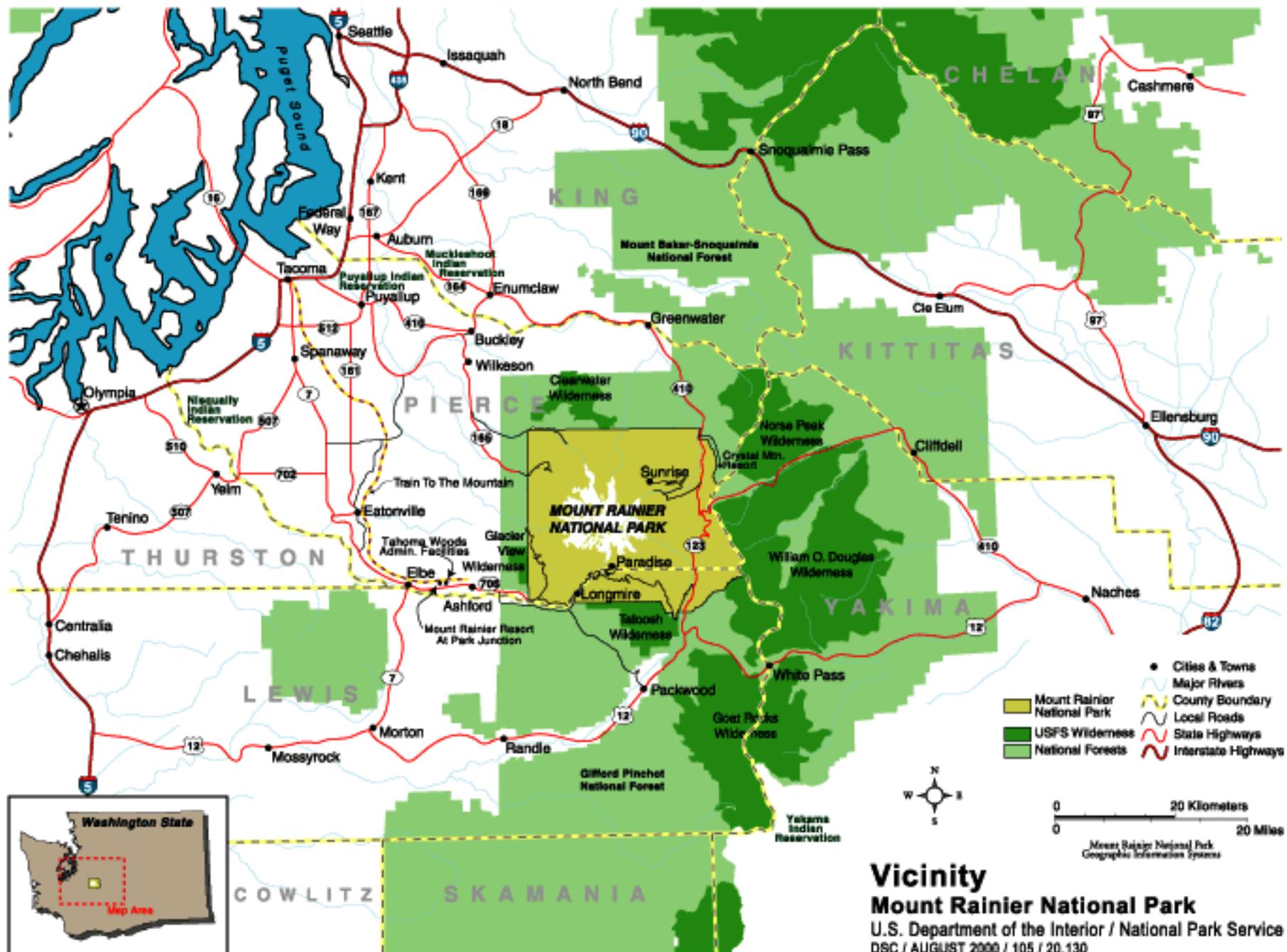
The park's rugged, precipitous topography consists mainly of peaks and valleys. The flanks of the mountain are drained by five major rivers and their tributaries. Each major river occupies a deep canyon with floors that are 1,000 to 3,000 feet below the adjacent divides. Valley floor gradients are steep and increase markedly upstream, especially in Tahoma Creek, North and South Puyallup Rivers, and Mowich River. The mountain's summit towers 9,000 to 11,000 feet above valley floors only 3 to 6 miles away. Besides the glaciers, other water resources in the park include 470 mapped rivers and streams, 382 mapped lakes and ponds, more than 2,500 acres of wetland, numerous waterfalls, and mineral springs.

The park has three major ecological zones:

- Generally above treeline (about 6,000 feet in elevation) is the upper mountain or alpine zone, consisting of snow, ice, rock, and fragile alpine vegetation. This zone covers approximately 19% of the park.
- From about 5,000 feet elevation to treeline is the subalpine zone, which is characterized by scattered stands of subalpine fir and meadows with grass and heather. This zone, which covers approximately 23% of the park, is the portion of the wilderness most frequented by visitors.
- From the park boundaries to the subalpine meadows is the forest zone, which occupies approximately 58% of the park. The forest zone, which is dominated by western hemlock, silver fir, Douglas-fir, and western red cedar, includes most of the developed facilities.

The park's vegetation is diverse, reflecting the varied climatic and environmental conditions encountered across the park's 12,700-foot elevation gradient. Approximately 890 vascular plant species and more than 250 non-vascular plant species have been identified in the park. Mount Rainier also provides habitat for many wildlife species, including approximately 300 species of native birds, mammals, reptiles, amphibians, and fish.

In addition to its natural wonders, the national park has a long history of human activities. The area was used by Native Americans for hunting and gathering, as well as for spiritual and ceremonial purposes. In the early 20th century miners, climbers, and tourists, among others, came into the area. The establishment of the park, and subsequent planning and development for visitor use and landscape



**Vicinity**  
**Mount Rainier National Park**  
 U.S. Department of the Interior / National Park Service  
 DSC / AUGUST 2000 / 105 / 20,130

PURPOSE OF AND NEED FOR THE ACTION

back of map

protection, constitutes an important chapter in the development of the American park idea. As a result, Mount Rainier National Park has rich and diverse cultural resources, including pre-historic and historic archeological resources, historic structures, and cultural landscapes.

Congress recognized the special nature of Mount Rainier when it established the area as a national park on March 2, 1899. It was the nation's fifth national park. In 1963, the approximately 210-acre outlying Tahoma Woods area was set aside for park and visitor support facilities. Congress also recognized the wilderness values of the park, and in 1988 designated about 97% of the park as the Mount Rainier Wilderness.

Most developed areas in the park are of national significance and are included in the comprehensive Mount Rainier National Historic Landmark District, which was designated in 1997. The National Historic Landmark District sets Mount Rainier National Park apart as the best and most complete example of the conception and idea of the American national park as it was embodied and implemented through the master planning of the early 20<sup>th</sup> century.

Mount Rainier National Park's scenic landscapes — including the dense lower forests, the magnificent display of subalpine wildflowers, and the mountain itself — have attracted people for generations. The mountain is a destination for snow and ice climbers throughout the world. About 2 million people visit the park annually, with most visitation (75%) occurring between June and September.

## REGIONAL CONTEXT

Mount Rainier National Park is approximately 65 miles from the rapidly growing Seattle-Tacoma metropolitan area.

As shown in the Park Vicinity and Adjacent Land Ownership map, most of Mount Rainier National Park is bordered by the following national forest lands:

- Mount Baker-Snoqualmie National Forest to the southwest, northwest, and northeast
- Wenatchee National Forest to the east and southeast
- Gifford Pinchot National Forest to the south

Portions of the Mount Baker-Snoqualmie National Forest bordering the park are administered by the Wenatchee and Gifford Pinchot National Forests.

The following four national forest wilderness areas share common boundaries with Mount Rainier:

- Clearwater Wilderness (14,598 acres)
- William O. Douglas Wilderness (166,603 acres)
- Tatoosh Wilderness (15,700 acres)
- Glacier View Wilderness (3,080 acres)

These congressionally designated wilderness areas, which are also called "Congressionally Reserved Areas" under the *Northwest Forest Plan* (USFS and BLM 1994b) are managed by surrounding national forest districts under the Wilderness Act of 1964.

Outside of the wilderness areas, the national forests provide both developed and dispersed recreational facilities. Developed facilities include campgrounds and day-use picnic areas. Mountain bikes and off-road vehicles are permitted along designated road and trail corridors. No new trails, campgrounds, or other recreational facilities are currently being proposed for any of the forests surrounding the park, with the exception of Crystal Mountain ski resort. The nationally known Pacific Crest

Trail, which extends from California to Canada, passes in and out of the park's eastern wilderness boundary and the contiguous national forest's western wilderness boundary along the crest of the Cascades.

The designation of spotted owl habitat on forest lands surrounding Mount Rainier National Park, along with increased regional recreation demands, have greatly reduced timber harvesting activities in large areas of the national forests. However, logging continues to occur around the park, up to its boundary in places. Most of the bordering nonwilderness forest lands are classified by the U.S. Forest Service as "late successional reserves," which are being managed over the long term to protect and enhance late-successional and old-growth forest characteristics, including habitat for the northern spotted owl. Although thinning and silvicultural treatments are allowed in these national forest reserves, they may occur only in stands up to 80 years of age and only if the treatments are determined to be beneficial to the creation and maintenance of late-successional forest conditions.

"Matrix lands," as defined by the *Northwest Forest Plan* (USFS and BLM 1994b), are national forest areas where most timber harvest and other silvicultural activities are conducted. The matrix lands do not include forested and nonforested areas that may be technically unsuited for timber production. Matrix lands are scattered along or near the southwest, northwest, and northeast corners of the park, and are adjacent to the Mather Memorial Parkway.

Private lands are located along the park's western boundary in Pierce County. Rainier Timber Company, LLC, owns about 120,000 acres of land near the western park boundary. Plum Creek owns three sections of productive timberland near the northern and western boundaries of the park.

## THE PLANNING PROCESS

General management planning for Mount Rainier National Park is guided by the major elements of park planning and decision-making prescribed by the National Environmental Policy Act (NEPA) and other federal laws, as well as by NPS policies. Several scoping meetings were held in surrounding communities in 1994 to identify the public's concerns about major issues facing the park. At about the same time, the planning team developed statements regarding the park's purposes and significance. These statements have served as the parameters for all subsequent planning.

Once the issues were understood, the planning team defined prescriptive management zones and a list of goals statements that describe what the park should look like in 20 years. The zones were applied in different summer and winter configurations for the wilderness (backcountry) and nonwilderness (frontcountry) portions of the park. The team assessed and presented the general consequences for each configuration to the public for review, and used the public input to establish the new goals for the park.

After goals and potential management zones had been identified, several draft management alternatives were developed for the park. Because use of the park varies by season, these alternatives were divided into summer and winter actions. Initially, four alternatives were developed by the planning team, including a no action (continue current management) alternative, as required by NEPA. The preliminary alternatives were presented during public meetings in September 1997.

After the initial four alternatives had been defined, a preferred alternative was developed. This involved evaluating the four preliminary alternatives using an objective analysis process called "choosing by advantages." This process evaluated the preliminary action alternatives

by identifying and comparing the relative advantages of each according to a set of goals and facts. The planning team compared the benefits or advantages of each alternative for each of the following areas:

- preserving wilderness values and conditions
- preserving the national historic landmark district, archeological resources, and other important cultural resources
- preserving natural processes and resources, including plants, animals, air, water, and threatened or endangered species
- protecting scenic resources and natural soundscapes
- providing opportunities for visitor enjoyment, including offering a range in types of activities and experiences, the ability of the park to accommodate demand for these opportunities, and the convenience, type, and location of information, orientation, and interpretation
- promoting healthy conditions to keep people safe from geologic hazards, avalanches, pedestrian-vehicle conflicts, and concentrated campfire smoke and vehicle exhaust
- providing an efficient level and magnitude of operations
- having potentially beneficial effects on nearby communities

This comparison helped the planning team determine the actions that would present the greatest advantages to the resources and the public.

The costs of implementing each proposal were also considered. These included both the costs related to any new development and the cost of operating and maintaining the facilities for 25 years.

The relationships between the advantages and costs of each alternative were established. This information was used to combine the “best” attributes of the four initial alternatives into the preferred alternative. This alternative provides the National Park Service with the greatest overall benefits for each point listed above, for the most reasonable costs.

Based on further analysis, two of the initial alternatives were dropped because there were very few differences in the management directions and zoning strategies compared to the other alternatives. Further adjustments were made to the alternatives after park staff reviews.

The three alternatives presented in this document present different options for managing Mount Rainier National Park:

- a no-action alternative (continue current management), as required by the National Environmental Policy Act (NEPA)
- the preferred alternative
- an alternative that would provide more opportunities for visitors to use the park in different ways than in the preferred alternative

This *Final General Management Plan / Environmental Impact Statement* includes revisions that were made in the preferred alternative and the other alternatives in response to public comments on the draft document. A minimum of 30 days after this final environmental impact statement is published, the National Park Service will prepare a record of decision in which the final plan will be approved. After the regional director signs the record of decision and it is published in the *Federal Register*, the park staff will begin implementing the general management plan.

## DIRECTION FOR THE PLAN

The direction for the alternatives considered in this *Final General Management Plan / Environmental Impact Statement* is based on the description of the park's purpose and significance, as well as other applicable policies and laws. The purpose of the park, as stated below, describes why Mount Rainier was set aside as a national park. The significance section describes the unique qualities that make the park a special place. Other legislative mandates help to further define parameters of how planning should be done and certain elements that the management plan must address.

### PARK PURPOSES

The purposes of Mount Rainier National Park are stated in the legislation establishing the

park and the legislation governing the National Park Service (see the box below and appendix A). Mount Rainier National Park is to be managed

- to protect and preserve its natural and cultural resources, processes, and values, while recognizing their increasing importance in the region, the nation, and the world
- to provide opportunities for visitors to experience and understand the park environment without impairing its resources to maintain wilderness values
- to provide for wilderness experiences

#### **Mount Rainier National Park Enabling Legislation and the NPS Organic Act**

Congress established Mount Rainier National Park on March 2, 1899. The legislation states that the park is set apart as a public park for the benefit and enjoyment of the people. The park was placed under the exclusive control of the secretary of the interior, who was given authority to

“make and publish . . . rules and regulations . . . [to] provide for the preservation from injury or spoliation of all timber, mineral deposits, natural curiosities, or wonders . . . and their retention in their natural condition”

“grant parcels of ground [for] the erection of buildings for the accommodation of visitors”

“provide against the wanton destruction of the fish and game found within the park”

Mount Rainier National Park is also administered under the provisions of the National Park Service's Organic Act of 1916, which specifies that units of the national park system are managed “to conserve the scenery and the natural and historic objects and the wild life therein” and “to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (16 USC 1). The Redwoods Act of 1978 amended the Organic Act to state that the management of national park units shall not “be exercised in derogation of the values and purposes for which these areas have been established, except as may have been or shall be directly and specifically provided by Congress.”

## **PARK SIGNIFICANCE**

Mount Rainier's significance and unique characteristics are described below:

- At a height of 14,411 feet, Mount Rainier is the highest volcanic peak in the contiguous United States. It reaches into the upper atmosphere to disturb great tides of eastward moving Pacific maritime air, resulting in spectacular cloud formations, prodigious amounts of rain, and record-setting snowfalls.
- As a part of the Pacific Ring of Fire, Mount Rainier is an outstanding example of Cascade volcanism.
- Mount Rainier has the largest alpine glacial system in the contiguous United States.
- Mount Rainier's eruptions and mudflows continue to shape the park and are a continual threat to park visitors, employees, and surrounding lowland communities.
- Because of its great elevation range and extensive glacial systems, Mount Rainier offers outstanding opportunities to study how biological communities respond to climatic change
- The park contains outstanding examples of diverse vegetation communities, ranging from old-growth forest to subalpine meadows and ancient alpine heather.
- The park is a vital remnant of the once widespread primeval Cascade ecosystem and provides habitat for many species representative of the region's flora and fauna.
- As urban development expands, the park continues to be a large island of protected open space where ecosystem processes dominate.
- The park's comprehensive national historic landmark district — a cultural landscape district including buildings, roads, Wonderland and Northern Loop trails, and other landscape structures — is the most significant and complete example of NPS master planning and park development in the first half of the 20th century.
- The developed areas of Mount Rainier contain some of the nation's best examples of "NPS Rustic" style architecture of the 1920s and 1930s.
- Called by some Native American groups "the place where rivers begin," Mount Rainier's watersheds nourish plant and animal communities in the park, extend to the valleys below, and remain an important source of water for the Puget Sound region.
- Mount Rainier, visible throughout the region, is a continuing source of inspiration to people. This quality contributed to the establishment of the national park in 1899. The mountain is a prominent icon that continues to shape the physical environment and human experience in the Pacific Northwest.
- For many generations, Pacific Northwest Native American tribes have been inspired by Mount Rainier's grandeur and massive prominence in the Cascades region. At least five contemporary, descendant tribes — the Nisqually, Muckleshoot, Puyallup, Yakama, and Cowlitz — are associated with traditional uses of Mount Rainier. These peoples are modern representatives of broad regional ancestry that lived in and used lowland and mountain terrain in the vicinity of Mount Rainier. The resources of the park are important to the contemporary Native American tribes, providing spiritual and cultural sustenance.

## PURPOSE OF AND NEED FOR THE ACTION

- The park offers recreational and educational opportunities in a wide range of scenic settings, including wildflower meadows, glaciers, and rainforests, all in a relatively compact area that is easily accessible to a large urban population.
- Mount Rainier's terrain and weather conditions offer world-class climbing opportunities that have tested the skills of climbers for more than a century.

## PARK MISSION

The National Park Service has developed the following mission statement for Mount Rainier National Park:

Together we preserve, for future generations, the natural and cultural resources in Mount Rainier National Park.

Through a variety of high quality park experiences, we promote park values, personal connections, and responsibility for the environment in our local and global communities.

With integrity, teamwork, pride, and motivation, we demonstrate environmental leadership and deepen our understanding of the park's ecosystems. We value our diverse range of individual contributions by showing respect and concern for each other and the park.

The Mountain inspires stewardship. Its protection and preservation is our legacy.

## MISSION GOALS FOR THE PARK

Mission goals for the park are statements of desired future conditions. Goals have been developed for resource stewardship and protection, access and enjoyment, education and interpretation, proactive leadership, science and research, and professionalism.

## Resource Stewardship and Protection

The primary responsibility of the National Park Service is the protection of park resources from internal and external impairment.

**Goal 1:** The natural and cultural resources and associated values of Mount Rainier National Park are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context.

**Goal 2:** Mount Rainier National Park contributes to knowledge about natural and cultural resources and associated values; management decisions are based on adequate scholarly and scientific information.

## Access and Enjoyment

The park will be managed to provide the nation's diverse public with access to and recreational and educational enjoyment of the lessons contained in Mount Rainier National Park, while maintaining unimpaired those unique attributes that are its contribution to the national park system.

**Goal 1:** Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities at Mount Rainier National Park.

**Goal 2:** Gateway communities are encouraged to provide services and facilities that assist visitors in enjoying and understanding park values and that minimize impacts on park resources.

## Education and Interpretation

It is the responsibility of the National Park Service to interpret and convey the contributions of each park unit and the park system as a whole to the nation's values, character, and experience.

**Goal 1:** Stimulate visitor appreciation of park resources; respect for values; understanding of management policies; and safe, acceptable recreation through onsite interpretive services.

**Goal 2:** Impart an understanding and appreciation of the National Park Service values, management policies, diversity of park system resources, and environmental stewardship to all segments of the population through education outreach.

### **Proactive Leadership**

The National Park Service must be a leader in local, national, and international park affairs, actively pursuing the National Park Service mission and assisting others in managing their park resources and values.

**Goal 1:** Promote and foster partnerships with individuals and groups who affect or are affected by the park.

**Goal 2:** Build public support for park management policies and environmental stewardship through leading by example.

**Goal 3:** Demonstrate the park's commitment to environmental stewardship by offering and sharing expertise and capabilities of park staff to external organizations and communities.

### **Science and Research**

The National Park Service must engage in a sustained and integrated program of natural, cultural, and social science resource management and research aimed at acquiring and using the information needed to manage and protect park resources.

**Goal 1:** Establish and maintain inventory and long-term monitoring programs for measuring the status and health of the park's natural, cultural, and social resources.

**Goal 2:** Establish a proactive research program responsive to park management needs and providing sound scientific information that affords greater insight into natural resource components, systems, and processes.

### **Professionalism**

The National Park Service must create and maintain a highly professional organization and diverse workforce.

**Goal 1:** Define, create, and maintain an organization that will enhance efficiency, effectiveness, and accountability.

**Goal 2:** Create and maintain a diverse and dynamic motivated work force that meets the highest standards of professionalism and is dedicated to the mission of the National Park Service.

## **GUIDING MANAGEMENT PRINCIPLES AND STRATEGIES**

Federal laws and park policies affect the management of Mount Rainier National Park. Federal mandates such as the Endangered Species Act, the Wilderness Act, the National Historic Preservation Act, the National Environmental Policy Act, and Executive Orders 11988 ("Floodplain Management") and 11990 ("Protection of Wetlands"), affect what can and cannot be done at Mount Rainier National Park. Many NPS policies and goals, identified in NPS *Management Policies* (NPS 2001a), and the "Strategic Plan" (NPS 2000b), also determine many of the actions taken by the park staff in natural and cultural resources management, use of the wilderness area, development of park facilities, and visitor use management. These laws and policies would continue to guide management under all of the alternatives described in this document.

Listed below are a number of guiding principles and strategies, based on mandates and NPS policies, which would continue to shape the way

in which Mount Rainier is managed under the alternatives being considered in this plan. All of the alternatives support the purposes and significance of Mount Rainier National Park. Some of these principles and strategies describe approaches the park staff is currently taking. Other principles and strategies are not currently being implemented but are consistent with NPS policy, are not controversial, and their implementation would require no additional analysis under the National Environmental Policy Act.

### **Ecosystem Management**

Ecosystem management is a collaborative approach to natural and cultural resource management that integrates scientific knowledge of ecological relationships with resource stewardship practices for the goal of sustainable ecological, cultural, and socioeconomic systems.

Approaches to ecosystem management are varied and occur at many levels. Achieving the desired future conditions stated in this plan for park resources requires that a regional perspective be considered, recognizing that actions taken on lands surrounding the park directly and indirectly affect the park. Many of the threats to park resources, such as invasive species and air pollution, come from outside of the park boundaries, requiring an ecosystem approach to understand and manage the park's natural resources.

Imperative in this effort is understanding the health or condition of the ecosystem. Key indicators of resource or system conditions must be identified and monitored (see below).

Cooperation, coordination, negotiation, and partnerships with agencies and neighbors are also crucial to meeting or maintaining desired future conditions for the park while recognizing the need to accommodate multiple uses on a regional scale. This approach to ecosystem management may involve many parties (e.g., the National Park Service's involvement with the

*Northwest Forest Plan* and the collaborative decision-making process involving regional air quality negotiations) or cooperative arrangements with state agencies or tribes to obtain a better understanding of transboundary issues (e.g., elk and northern spotted owl population dynamics).

Mount Rainier is managed holistically as part of a greater ecological, social, economic, and cultural system. The following strategies will allow the National Park Service to provide leadership in resource stewardship and conservation of ecosystem values within and outside the park. These strategies will allow for good relations to be maintained with adjacent landowners, surrounding communities, and private and public groups that affect, and are affected by, the park. The strategies will also allow the park to be managed proactively to resolve external issues and concerns to ensure park values are not compromised.

- The National Park Service will continue to seek cooperative agreements with the U.S. Forest Service and other adjacent land management agencies to protect ecosystem habitat and wildlife corridors.
- The park staff will continue to develop cooperative agreements, partnerships, and other feasible arrangements to set an example in resource conservation and innovation, and to facilitate research related to park resources and their management.
- Communication protocols will be developed with regional recreation land managers, tribes, transportation providers, tourism boards, and other applicable organizations to let them know when high use levels are occurring at the park. These protocols will help alert visitors to conditions at the park, and what other options are available, before they arrive, and alert the above organizations that they may be affected as well.

- When feasible, partnerships will be sought with other public agencies in sharing office space, orientation and contact stations, and employee housing.
- The park staff will work collaboratively with the landowners along the road corridors leading to the park, including the U.S. Forest Service, Native American tribes, Washington State Departments of Natural Resources and Transportation, municipalities and communities, counties, timber companies, and other businesses, to protect the viewshed leading into the park. A variety of techniques could be used to protect the visual, natural, and cultural resources along the roads, including cooperative agreements, conservation easements, donations, and land exchanges. Cooperatively produced management plans may be produced, which examine the future of the corridors and set guidelines for future uses and development.

### **Relations with Private and Public Organizations, Owners of Adjacent Land, and Governmental Agencies**

As noted above, Mount Rainier National Park — socially, politically, ecologically, and historically — is part of a greater area. The National Park Service must consider how its actions in Mount Rainier affect the surrounding environment and society. For instance, the management of the park influences local economies through tourism expenditures and the goods and services the Park Service purchases to support park operations.

To ensure that the National Park Service maintains good relations with landowners and communities surrounding Mount Rainier National Park, and to ensure that the park is managed proactively to resolve external issues and concerns, the following strategies will be implemented:

- The park staff will continue to establish and foster partnerships with public and private

organizations to achieve the purposes and mission of the park. Partnerships will be sought for resource protection, research, education, visitor enjoyment, visitor access, and corridor management purposes.

- To foster a spirit of cooperation with neighbors and encourage compatible adjacent land uses, the park staff will keep landowners, land managers, tribes, local governments, and the public informed about park management activities. Periodic consultations will occur with landowners and communities who are affected by, or potentially affected by park visitors and management actions. Park staff will respond promptly to conflicts that arose over their activities, visitor access, and proposed activities and developments on adjacent lands that could affect Mount Rainier. Park managers will seek agreements with landowners to encourage their lands to be managed in a manner compatible with park purposes. Park staff also will seek ways to give landowners technical and management assistance to address issues of mutual interest.

- The National Park Service will work closely with local, state, and federal agencies and tribal governments whose programs affect, or are affected by, activities in Mount Rainier. The park staff will continue to coordinate with local, state, and federal agencies. In particular, park managers will maintain a close working relationship with the U.S. Forest Service, whose lands abut much of the park, to meet mutual management needs. Park managers also will pursue cooperative regional planning whenever possible to integrate the park into issues of regional concern.
- The park staff will work with national forest managers and owners of adjacent properties to encourage the adoption of timber practices in lands surrounding the park that protect resource values. These practices may

include longer rotations in timber cuts, uneven aged cuts, no-cut buffers in riparian areas, leaving snags and downed logs, and maintaining vegetation on ridgetops.

### **Relationships with Native Americans**

The National Park Service recognizes that Mount Rainier has long occupied a prominent position for American Indian people in the Pacific Northwest. The park staff will work to ensure that traditional Native American ties to the mountain are recognized and will strive to maintain positive, productive, government-to-government relationships with tribes culturally affiliated with Mount Rainier. The viewpoints and needs of tribes will continue to be respected, and issues that arise will be promptly addressed. Native American values will be considered in the management and operation of the park.

**Legal Background.** Federally recognized tribes are sovereign governments. At least five federally recognized tribes have traditional association with Mount Rainier — the Muckleshoot Indian Tribe, the Puyallup Tribe of Indians, the Nisqually Indian Tribe, the Cowlitz Indian Tribe, and the Yakama Indian Nation. Today's names were assigned by the United States territorial government in conjunction with the signing of the Medicine Creek, Point Elliott, and Yakama Treaties in 1854 and 1855, grouped as the Stevens Treaties after then Governor Isaac Stevens. The names reflect specific geographic locations associated with the tribes at the time of the treaties. The Yakama Nation is considered in the Treaty with the Yakama (1855), the Nisqually and Puyallup in the Treaty of Medicine Creek (1854), and the Muckleshoot within both the Medicine Creek Treaty and the Treaty of Point Elliott (1855). The Cowlitz tribe did not sign a treaty, although they were present at the negotiations of the Chehalis River Treaty of 1855. These treaties establish certain rights

and privileges in the tribes, which have occasionally been interpreted through litigation (e.g., *United States v. State of Washington* (“the Boldt decision”), 384 F. Supp. 312 (W.D. Wash. 1974)) or affected by legislation or regulation.

Ethnographic evidence supports historical activity in the park, and anecdotal sources and recent consultations suggest ongoing contemporary uses of the park. Mount Rainier National Park, established in 1899, is an area where all resources are protected for future generations of all Americans. In that regard, Mount Rainier is unique among traditional use areas in the region. As the park broadens its research and collaborative efforts with tribal groups, it is likely that Native American uses of Mount Rainier will become better understood. Tribal and park partnerships provide an opportunity to cooperate in mutually beneficial efforts for the purpose of preserving the park's resources to their fullest extent and highest level of integrity.

**General Management Strategies.** To enhance the National Park Service's relationship with the tribes, the strategies and actions listed below will be followed.

- Consult regularly and maintain government-to-government relations with American Indian tribes that have traditional ties to resources within the park to ensure productive, collaborative working relationships. The park staff will build on existing relationships, identifying partnerships and activities of mutual benefit.
- Continue to identify and deepen the understanding of the significance of the park's resources and landscapes to Indian people through collaborative research and sharing.
- Once identified, protect and preserve sites, resources, landscapes, and structures of

significance to the federally recognized tribes as required under federal laws and NPS *Management Policies*.

- Encourage the participation of American Indian tribes in protecting the park's natural and cultural resources of interest and concern to them.
- Involve American Indian tribes in the park's interpretation program to promote accuracy of information regarding American Indian cultural values and to enhance public appreciation of those values.
- Participate as partners with American Indian tribes in planning projects and research initiatives of mutual benefit that enhance resource protection, visitor experiences, and public appreciation for park resources and values.
- Support sustainable economic development that encourages the availability of appropriate visitor services in American Indian communities adjacent to the park.
- Support the continuation of traditional American Indian activities in the park to the extent allowed by applicable laws and regulations.
- The staff of Mount Rainier National Park will continue to consult and collaborate with American Indian tribes concerning issues and proposed actions that might affect American Indians.
- Collaborate with the tribes to assist, where appropriate, on issues related to resources on their respective reservations affected by public use and resource management within Mount Rainier National Park.

**Government to Government Relations/ Consultation.** American Indian tribes are

generally seeking more involvement in the planning and implementation of resource management actions on ancestral lands that have been linked to the tribes' uses of the park. Federally recognized tribes have unique legal relationships with federal agencies like the National Park Service based on law and policy (e.g., Executive Order No. 13,175 on Consultation and Coordination with Indian Tribal Governments; Executive Order No. 13,007 on Sacred Sites). These relationships are strengthened by the local American Indians' special geographic, economic, historical, and cultural ties to the lands and resources now within the park.

Federal legislation and NPS policies recognize these relationships and require consultations and government-to-government interactions. Other federal laws impose additional obligations on federal agencies and authorize activities that influence these relationships; they also provide opportunities to collaborate in protecting the park's resources and values.

- The staff of Mount Rainier National Park will continue to consult and collaborate with American Indian tribes concerning issues and proposed actions that might affect American Indians.
- The park staff will meet with tribal governments on a regular and periodic basis.
- The park staff also will pursue agreements for the purposes of carrying out programs, services and activities that are of mutual benefit and interest.

**Interpretation.** Visitors to the park are generally unaware of the historical and contemporary connections that local American Indians have to the park's lands and resources. In addition, the tribes have expressed concern over a loss of understanding among their members of these primary relationships to the park. Enhancing visitor understanding and

appreciation, and refamiliarizing tribal members with principal park resources will promote a better public appreciation of local American Indian spiritual and cultural ties to the park and serve to protect the park's overall significance.

- Local tribes will assist in planning, and will participate in and contribute to the park's interpretation and education programs. Potential opportunities include providing training for park staff, drafting and reviewing relevant exhibits and interpretive material, providing appropriate Indian-made items for sale or display in the park's visitor center gift shops, presenting guest programs, demonstrating traditional arts, and working as seasonal and permanent staff.

**Traditional Activities on Park and Aboriginal Lands.** Collection and gathering of materials for economic, spiritual, and ceremonial purposes is an important issue with American Indian tribes. Sites and resources integral to these purposes are largely unknown to park managers. The park also contains sites of interest for religious and ceremonial purposes that remain undocumented.

- The National Park Service will continue to support American Indian traditional activities within and adjacent to the park. Access and privacy for traditional ceremonial purposes will be provided. Within the park, the collection of certain natural plant materials by American Indians for traditional uses will be allowed as authorized under applicable laws and regulations.
- Local tribes will be afforded the opportunity to participate in the identification, designation, and protection of traditional cultural and ethnographic landscapes.

**Resource Management Collaboration.** Several tribes maintain downstream fisheries on rivers with sources in the park. Several tribes

are actively researching wildlife species that have resident populations in the park. Archeological research in the park may yield sites and artifacts of concern to the tribes. The local American Indian tribes and the National Park Service share interests in protecting resources within and adjacent to the park. The potential for productive collaboration is high. For example, the Nisqually, Puyallup, Muckleshoot, and Yakama have professional resource management staff. The Puyallup have full GIS capability. The park has a complete natural and cultural resources division with an archeologist, numerous scientists, and GIS capability.

- Mount Rainier staff and tribal staff will share relevant, nonproprietary information pertaining to the inventory and management of resources within the park consistent with federal law. Research, transfer of technology, and technical assistance are important components of these government-to-government relationships.
- Park natural and cultural resources staff will collaborate with tribal resources staffs on projects or programs of mutual interest and will meet on a regular basis to discuss various aspects of programs including future plans, results, staffing, and research data. Park staff will encourage active participation of appropriate tribal members on field project staff.

### **Protecting and Managing Natural Resources**

The protection, study, and management of the park's natural resources and processes is essential for achieving the park's purposes and mission goals. The following principles and strategies will guide the National Park Service in retaining Mount Rainier's ecological integrity, including its natural resources and processes. They will help ensure that the natural features of the park are unimpaired, that the park continues to be a dynamic,

biologically diverse environment, and that Mount Rainier is recognized and valued as an outstanding example of resource stewardship, conservation, education, and public use.

**Inventory and Monitoring.** Knowing the condition of natural resources in national parks is fundamental to the National Park Service's ability to protect and manage parks. Mount Rainier is confronted with increasingly complex and challenging issues, and the park staff must provide scientifically credible data to inform and defend management actions. Inventories involve the compilation of existing information as well as the collection of new information. They contribute to a statement of the condition of park resources in relation to a standard condition, especially the natural or unimpaired state.

Ecosystem monitoring is conducted to detect significant changes in resource abundance, condition, population structure, or ecological processes or to determine the effects of a management action on population or community dynamics or ecological processes. The purpose of monitoring is to develop broad-based, scientifically sound information on the current status and long term trends in the composition, structure, and function of the park's ecosystems.

A long-term ecosystem monitoring program is necessary to enable managers to make better informed decisions, to provide early warning of changing conditions in time to develop effective mitigating measures, to convince other agencies and individuals to make decisions benefiting parks, to satisfy certain legal mandates, and to provide reference data for relatively pristine sites for comparison with areas outside of parks. Monitoring also enables the park staff to evaluate the effectiveness of management actions and to obtain more accurate assessments of progress towards management goals. Using monitoring information will increase confidence in managers'

decisions and improve their ability to manage park resources.

- Inventories and long-term monitoring programs will be developed to address the status and health of the park. Key indicators of resource or ecosystem conditions will be developed and monitored over the long-term to keep track of ecosystem health.
- Inventories will be conducted to identify vertebrate and invertebrate animal species, vascular and nonvascular plant species, and air, water, and geologic resources in the park.
- Additional data will be gathered on social and natural condition indicators for application to the carrying capacity model.
- Mount Rainier will continue to participate in the North Coast and Cascades Inventory and Monitoring Network. The park staff will work with its partner park units and collaborators in inventorying resources, monitoring vital components of the ecosystem to better assess the condition of park resources and trends and developing databases and data analysis and retrieval tools to improve the usefulness of natural resource information.

**Air Quality.** Mount Rainier is designated a class I area under the Clean Air Act. This designation permits the least degradation of air quality and air quality related values, including visibility. The following policies and strategies will ensure that Mount Rainier's air quality is enhanced or maintained with no significant degradation and that nearly unimpaired views of the landscape both within and outside the park are available. The policies and strategies will also ensure that scenic views that are integral to the visitor experience, which have been identified in the park in accordance with the Clean Air Act, remain substantially unimpaired.

## PURPOSE OF AND NEED FOR THE ACTION

- In Mount Rainier, the National Park Service will strive to set a global example of how to effectively protect class I areas and critical airsheds.
- Emissions associated with administrative and recreational use of the park will be reduced.
- Baseline information and monitoring of air quality related values will be expanded through research, inventory, and monitoring programs to identify human stressors and general air quality trends.
- Programs will be expanded to share air quality information with surrounding agencies and to develop educational programs to inform visitors, as well as regional residents, about the threats of air pollution to park resources.
- The park staff will continue to participate in regional air quality planning, research, and the implementation of air quality standards. Regional partnerships for the development of alternative transportation systems and clean fuels that improve air quality will be promoted.
- A comprehensive plan will be developed to address geologic research, inventory, and monitoring.
- Inventories and monitoring of park glaciers will be expanded to better understand the role of climate change, and to assess the effects of this change on park resources, infrastructure, and visitor safety.
- Baseline information on soils and more detailed information on surficial geology will be obtained for use in ecosystem management and hazards assessment.
- Park staff will continue to partner with the U.S. Geological Survey, state and local agencies, and academic institutions to assess and monitor geologic hazards.
- Interpretive and educational programs will be developed to educate visitors and the public on park geologic resources including hazards associated with these resources

**Geologic Resources.** The park includes outstanding geologic and hydrologic resources that represent key physical elements in the park ecosystem, including glaciers and snowfields, geomorphic features such as watersheds and landforms, soils, and paleoecologic deposits. Glaciers, snowfields, watersheds, and soils are especially sensitive to air pollution and climatic change. The following strategies will be implemented to better understand geologic resources and their effects on ecosystem processes, functions and components; to identify and monitor human stressors to geologic resources; and to assess and monitor potential effects on visitors and adjacent communities.

**Water Quality and Aquatic Resources.** The National Park Service will continue to protect the pristine water quality in the park and to pursue the designation of park waters as “outstanding natural resource waters.”

- The condition of aquatic resources will be assessed, including physical, chemical, and biological components and processes, across a range of spatial and temporal scales. Appropriate indicators and measurements will be used to quantify and detect the potential effects of human-caused stressors through long-term monitoring programs.
- The effects of visitor use on aquatic resources will be monitored. Administrative uses that could adversely affect aquatic resources will also be monitored. If conditions are determined to be out of

standard, actions will be taken to prevent degradation of the park's water quality.

- Stormwater runoff from roads and parking lots will be assessed and "best management practices" will be implemented to reduce any potential impacts.
- Air quality effects on aquatic resources will be assessed and monitored, and information will be provided to regulators for use in state and regional air quality management and permitting.
- Educational programs will be developed to inform visitors and the general public about water resource management issues and concerns.

**Vegetation.** Plant communities and the processes governing them will continue unaltered in the majority of the park. Communities will include the diverse species, genetics, associations, and successional stages representative of an ecologically functioning system in the Northern Cascades.

- Plant communities will be monitored to assess their condition. If it is shown that human use is degrading an area, a variety of mitigating measures will be considered to restore the area to acceptable standards. Such measures may include establishing trails, delineating or hardening trails, erecting signs or taking other educational measures, restricting access to problem areas, closing problem areas, restoring degraded areas, or limiting trail use in the "shoulder" seasons until there is enough snow to protect vegetation. Sensitive subalpine and alpine meadows will be given extra protection. The restoration of affected subalpine meadows, such as in the Paradise and Sunrise areas, will continue.
- The National Park Service will continue to eradicate invasive exotic (nonnative) plants in the park. The park staff will work

with the U.S. Forest Service, Washington Department of Natural Resources, Native American tribes, timber companies, and private landowners to prevent the spread of exotic plant species into the park.

- Monitoring programs will be developed to detect the effects of human stressors on vegetation and to determine natural vegetation dynamics and processes.

**Wildlife and Fisheries.** The condition of wildlife and fisheries resources will be determined across a range of spatial and temporal scales, and appropriate indicators and measurements will be utilized to quantify and detect the potential effects of human-caused stressors through baseline inventories and long-term monitoring programs.

- The park staff will seek to preserve or restore natural aquatic habitats and the natural abundance and distribution of native aquatic species, together with the associated terrestrial habitats and species. Partnerships will be developed with other federal, state, local, and tribal agencies to restore native resident and anadromous fish species in park streams. The restoration of fish species would be practiced with the use of the best available data, would be based on suitable habitat, and would be subject to the provisions of the National Environmental Policy Act.
- The park staff will seek to perpetuate the native animal life (such as mammals, birds, reptiles, fish, arthropods, and microfauna) as part of the natural ecosystem. Minimizing human impacts on native animals will be emphasized, as will minimizing human influence on naturally occurring fluctuations of animal populations. Ecological processes will be relied on to control populations of native species to the greatest extent practicable.

## PURPOSE OF AND NEED FOR THE ACTION

- The preservation of populations and habitats of migratory species inhabiting the park, such as bats, elk, and anadromous fish, will be ensured. Park staff will cooperate wherever possible with others to ensure the preservation of their populations and habitats outside the park.
- Education programs will be developed to inform visitors and the general public about fish and wildlife issues and concerns.
- The management of populations of exotic fish and other animal species will be undertaken wherever such species threaten park resources or public health and when control is prudent and feasible.
- Developed areas and wilderness campsites will be managed to reduce to the maximum extent possible the potential for wildlife to become accustomed to receiving human food and the associated unnatural tameness, unpredictable aggression, and other safety and health concerns that can result.
- If conflicts between people and wildlife take place, actions such as posting of warnings and administrative closures will be taken to protect visitors and wildlife. It is the park's policy that to the maximum extent possible, large carnivores will be allowed to possess and exhibit natural behaviors relating to seasonal movements and the defense of young or of food resources. This will be achieved through public education and wildlife inventory and monitoring programs. Appropriate educational materials will be made available at campgrounds and visitor center desks and in the park newspaper. These materials will address human-wildlife conflict issues and recommended behaviors to follow. In cases of attacks by wildlife, appropriate actions would be taken to protect visitors and wildlife.
- Park resource managers will continue to work with surrounding land management agencies to address the "edge effects" on species and their habitats. Such effects may result from activities occurring outside the park boundary, such as timber harvests, land development, and wildlife management practices.
- Fish and wildlife habitat will be protected through the timing of park activities and through consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, Native American tribes, and the Washington Department of Fish and Wildlife.

### **Threatened and Endangered Species and Other Special Status Species**

Under the Endangered Species Act, the National Park Service is mandated to promote the conservation of all federal threatened and endangered species and their critical habitats within the park boundaries. Five federally listed threatened or endangered species occur in the park. Another 31 federal species of concern and state endangered, threatened, sensitive, and candidate species also occur or are likely to occur in the park.

- The park staff will continue to work with the Washington Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service to ensure that the National Park Service's actions help special status species to recover. If any state or federally listed or proposed threatened or endangered species were found in areas that would be affected by construction, visitor use, or restoration activities proposed under any of the alternatives in this plan, the park staff would first consult informally with the above agencies. The park staff would then attempt to avoid, minimize, rectify, reduce, compensate, or otherwise

mitigate any potential adverse impacts on state or federal special status species. Should it be determined through informal consultation that an action or proposed project might adversely affect a federally listed or proposed species, the park staff would initiate formal consultation under section 7 of the Endangered Species Act.

- The park staff will cooperate with the above agencies in inventorying, monitoring, protecting, and perpetuating the natural distribution and abundance of all special status species (i.e., state and federally listed threatened, endangered, rare, declining, sensitive, candidate, or special concern species) and their essential habitats in Mount Rainier National Park. These species and their required habitats will be specifically considered in ongoing planning and management activities.

### Carrying Capacity

By law, all general management plans for units managed by the National Park Service must address the issue of carrying capacity.

Carrying capacity is a determination of what types and levels of visitor use can be accommodated while maintaining social and resource conditions consistent with the purposes of the park, its mission goals, and the prescriptive management zones. There are three major components of carrying capacity: *physical capacity* (for example, parking spaces, facility space, road capacity), the *visitor experience* (such as congestion in parking areas, opportunities for solitude), and *resources* (including natural and cultural resources). The carrying capacity in a given area could be exceeded for any of these components, which would trigger management action. The National Park Service uses the visitor experience and resource protection framework to address carrying capacities in national parks.

Increasing visitor use at Mount Rainier has resulted in changes in the park's resources and in the visitor experiences. Unacceptable resource damage has been documented in several areas, such as the Paradise Meadows and Spray Park. With use levels expected to increase in the future, there is the potential that additional unacceptable changes could occur to park resources and visitor experiences — changes that would be contrary to the purposes and significance of Mount Rainier National Park and the mission of the National Park Service. To prevent or minimize these impacts, the park staff will proactively manage visitor use and resources at Mount Rainier, using a tiered strategy of increasing management actions to decrease visitor use impacts.

### Managing and Protecting Wilderness

Adhering to the following strategies will ensure that wilderness lands in the park will retain their wilderness characteristics and values and that visitors will continue to find opportunities for solitude and primitive, unconfined recreation. These strategies will ensure that the signs of people remain substantially unnoticeable. Adherence to these strategies will also make sure that wilderness continues to be affected primarily by the forces of nature.

- The National Park Service will continue to manage wilderness camping through camping permits and by enforcing camping regulations, including those that pertain to appropriate location of campsites in wilderness areas.
- Wilderness education programs will be expanded to inform visitors about wilderness ethics and how to minimize their impacts on the park. Leave-no-trace practices will be emphasized.

- Efforts will be expanded to ensure that wilderness soundscapes and night skies are not degraded.

### **Managing and Protecting Cultural Resources**

Mount Rainier's cultural resources, especially its recently designated National Historic Landmark District, are integral to the park landscape. The protection of the park's cultural resources is essential for understanding the past, present, and future relationship of people with the park environment and the expressions of our cultural heritage. The strategies discussed below will enable the National Park Service to protect the park's cultural resources, including archeological, historic, ethnographic, museum collection, and archival resources, while encouraging visitors and employees to recognize and understand their value. The strategies will allow the integrity of the park's cultural resources to be preserved unimpaired. They will also ensure that Mount Rainier National Park is recognized and valued as an outstanding example of resource stewardship, conservation education and research, and public use.

Several strategies focus on the park's cultural landscapes and historic structures. These strategies will ensure the continued integrity and preservation of Mount Rainier's historic resources. They encourage appropriate adaptive use of the structures, which prolongs the life of the structures. The strategies also guide the management of concession-leased buildings in such a manner that they are maintained in good condition and retain eligibility for listing on the National Register of Historic Places. In addition, the strategies require that new construction be architecturally compatible in terms of design, materials, and scale with surrounding historic structures.

### **Prehistoric and Historic Archeological and Ethnographic Resources.**

The strategies for

managing and protecting prehistoric and historic archeological resources and ethnographic resources are as follows:

- The park staff will continue to survey and document or inventory archeological resources in accordance with the National Historic Preservation Act and other applicable regulations.
- Archeological sites will be monitored to assess site conditions and to determine any threats to the resources that may require mitigation.
- Field data regarding rock shelters, lithic scatters, hunting camps, and other resources will be gathered to develop a more accurate predictive model of prehistoric site distribution and to address related research questions.
- Archeological resources that reflect late 19th and early 20th century activities, such as park development, mining sites, cabin remains, and trash dumps, will continue to be inventoried, evaluated, and managed. National Register eligible resources will be documented and listed.
- All identified resources will continue to be evaluated in accordance with the eligibility criteria for the National Register of Historic Places.
- Avoidance techniques and other measures will be used to prevent visitor and project-related disturbances from impacting known significant sites.
- The park staff will continue to support research and consultation to increase our understanding of all cultural resources.
- As appropriate, American Indian tribes will be consulted on surveys, studies, excavations, and actions to protect archeological resources.

**Museum/Archival Collections.** The strategies for museum and archival collections will include the following:

- The park staff will continue to maintain a diverse and substantial collection of museum objects and specimens according to the park's approved "Scope of Collections Statement" (revised 1997). The collection includes historic artifacts, biological and geological specimens, historic images, archival materials, and prehistoric/historic archeological specimens and artifacts.
- The park staff will continue to improve artifact/specimen exhibit and storage conditions according to NPS museum standards. This may include the proposed rehabilitation of existing exhibits and the creation of new exhibits as proposed in this plan, as well as the installation of proposed security and fire protection systems to areas containing museum collection artifacts/specimens, as recommended in the 1998 "Curatorial Fire and Security Survey."
- The park staff will maintain and continue to expand opportunities for researchers to use the museum collection's artifacts, specimens, and archival materials.

**Cultural Landscapes and Historic Structures.** The strategies for cultural landscapes and historic structures include the following:

- The historic buildings, structures, sites, and objects contributing to the significance of the Mount Rainier National Historic Landmark District will be managed to retain a high degree of integrity. Comprehensive protection and preservation measures will be employed as required by the *Secretary of Interior's Standards for the Treatment of Historic Properties*.

- Historic buildings not actively being used in the park will be considered for adaptive reuse by other public and private entities to assist in the preservation of the structures.
- Design guidelines and/or historic structure and cultural landscape reports will continue to be created for all developed areas in the park to ensure that the architectural and landscape-defining features of these areas are preserved. These guidelines will include provisions for design review oversight to ensure the compatibility of new planning, design, and construction.
- Ongoing research, including cultural landscape inventories, reports, and historic structure reports, will continue to refine and update baseline information on historic resources identified as contributing to the national historic landmark district.
- The park's cultural landscapes will be documented and inventoried as part of the servicewide cultural landscape inventory, and they will be monitored to ensure their preservation.
- Cultural landscape reports with treatment recommendations will be prepared as needed for cultural landscapes (or component landscapes) that contribute to the National Historic Landmark District and other national register properties. Amendments to existing documentation related to the national register and the National Historic Landmark District may be required to include or expand the discussion of contributing cultural landscape characteristics and features.
- Design guidelines, based on documentation provided by the "Cultural Landscape Inventory" and "Cultural Landscape Report," will be prepared to provide another tool for effective management of the overall cultural landscape of the National Historic Landmark District.

### **Interpretation, Education, Information, and Orientation**

A variety of methods are used to orient visitors to Mount Rainier, to provide information about the park, and to interpret the park's resources to visitors. The National Park Service will pursue strategies to ensure that pre-trip information is available for visitors to plan a rewarding visit to the park. Outreach and education programs will help connect diverse audiences to the park's resources, build a local and national constituency, and gain public support for protecting the park's resources. Providing interpretation opportunities will build emotional, intellectual, and recreational ties with the park and its cultural and natural heritage.

- Emphasis will be placed on providing information, orientation, and interpretive services in the most effective manner possible. Appropriate techniques and technologies will be used to increase awareness and visibility of the national park system and its programs and of issues facing Mount Rainier National Park.
- Cooperative efforts and partnerships with adjacent gateway communities, public and private agencies, organizations, stakeholders, and land managers in the region will be enhanced to inform visitors on the abundance, variety, and availability of regional recreational and interpretive opportunities. This information will orient visitors on what to do (and what not to do), attractions to see, and how to enjoy the park in safe, low-impact ways.
- The park staff will strengthen partnerships with other state and national parks, educational institutions, and other organizations to enrich interpretive and educational opportunities regionally and nationally.
- A special effort will be made to educate the public about the special historical and

contemporary relationship that indigenous people hold to park lands and resources.

- An educational outreach program will be developed for schools and community groups to provide a continuum of quality experiences for lifelong learning. This program is intended to maximize the public's access to the unique ecological, historical, cultural, and geologic lessons contained in the park. This includes the establishment of "friends" groups, special programs for schoolchildren, and other programs relevant to diverse audiences.
- Emphasis will be placed on understanding current low levels of use by minority communities and on developing strategies to encourage greater relevance, use, and support of the park by these communities.

### **Commercial Services**

Commercial services are integral to the visitor experience and the management of Mount Rainier National Park. The National Park Service permits several commercial services at Mount Rainier, including guiding services, lodging, and food service. These services have added to visitors' enjoyment of the park, have enabled many people to see parts of the park they might not otherwise see, and have helped to protect park resources. Strategies for managing commercial services include the following:

- Manage businesses through concession contracts and commercial use authorizations; other activities, such as commercial filming, will continue to be managed through special use permits.
- Ensure that all commercial activities within the park provide high-quality visitor experiences while protecting important natural, cultural, and scenic resources.

- Ensure that before concession contracts and commercial use authorizations are renewed or readvertised, the types of authorized use are still necessary and/or appropriate, the levels of use are consistent with resource protection and quality visitor experiences, and the commercial services program can be managed in an efficient and effective manner.
- Limit the expansion or development of new commercial services facilities in the park; encourage such facilities outside the park.
- Prepare a commercial services plan that describes in detail the actions required to achieve commercial services and related visitor experience goals.

### **Transportation to and within the Park**

Transportation to and within Mount Rainier is, and will continue to be, a challenge. How people travel to the park and how they travel around the park plays a major role in the protection of park resources, in visitor levels and the visitor experience, and in the maintenance and need for modified or new park infrastructure. In this regard, it is critical for the National Park Service to participate as a partner in local, regional, and statewide planning efforts that will affect transportation to and within the park. Several strategies are being, and will continue to be, pursued in the transportation arena. The park staff will pursue the following strategies:

- Work with the gateway communities and local, regional, state, and federal agencies to develop a regional approach to transportation planning between Mount Rainier and the Puget Sound urban areas; encourage a multiagency, multicounty regional transportation planning group, with participants including the counties, metropolitan planning organizations,

regional transportation planning organizations, the U.S. Forest Service, the Washington Department of Transportation, gateway communities, cities, tribes, and private parties.

- Work with the U.S. Department of Transportation, the Federal Highway Administration, and the Washington Department of Transportation, and other sources to seek funding and staff to participate in and encourage effective regional transportation planning and enhancements, including both road and nonroad transportation (e.g., bikeways, road signs, trails, intelligent transportation systems, historic preservation, recreational access and facility development, visitor centers, traffic calming devices, gateway community enhancements).

### **Snowmachine Use in the Park**

In 1975 an environmental assessment was prepared on the proposed special regulations designating snowmobile routes in Mount Rainier National Park. This assessment determined that an environmental impact statement was not needed, which resulted in a negative declaration. Limited snowmobile use on designated areas was chosen as a result of selecting the best of four alternatives. A special regulation was promulgated as 36 CFR 7.5 opening the following areas in the park to snowmachines: Cougar Rock campground, Westside Road, Mather Memorial Parkway, White River Road to the White River campground, and the Stevens Canyon Road to Box Canyon. Currently, very little snowmachine activity occurs in these areas.

President Carter issued Executive Order 11989 in 1977. That executive order provided that snowmobile use shall be prohibited when it is found that it may cause, or is causing, considerable adverse effects on the soil, vegetation, wildlife habitat, or cultural or historic

resources of public lands. Recent studies on the negative impacts of snowmachines on the experience of visitors, air quality, and wildlife have led the National Park Service to determine that it is not complying with the executive order. Therefore, commensurate with a public notification in the *Federal Register* for a rescission of the regulation, all recreational snowmachine use within Mount Rainier National Park will be prohibited. This action will be implemented regardless of which alternative of this *General Management Plan* is selected.

In March 2001 the National Park Service issued an environmental assessment for rulemaking regarding snowmobiles in Mount Rainier National Park (NPS 2001a). The proposed action in the environmental assessment is the elimination of recreational snowmobile use in the park. Few comments were received on the park proposal to eliminate snowmachine use, but virtually all of the commenters supported the proposed action. Similarly, almost all of the comments received on the articulation of the snowmachine prohibition in the *Draft General Management Plan* supported the idea. To implement the prohibition, the park staff would act on the pending "Finding of No Significant Impact" and undertake a rulemaking in the *Federal Register*.

### **Levels and Types of Park Development**

A variety of different types of development exist in Mount Rainier to transport, house, inform, and serve visitors. The following general strategies are intended to ensure that park facilities serve visitor needs, meet sustainability standards, are harmonious with park resources, are compatible with natural processes and surrounding landscapes, and are aesthetically pleasing and functional. The strategies are also intended to ensure that the park's facilities are accessible for visitors with physical and learning disabilities, in con-

formance with applicable laws, regulations, and NPS policies.

- Park managers will consider the availability of existing or planned facilities in nearby communities and adjacent lands, as well as partnership possibilities, when deciding whether to construct new developments.
- Existing facilities will be modified to meet accessibility standards as funding allows, or as the facilities are replaced or rehabilitated. The park staff will periodically consult with persons with disabilities or their representatives to increase the park staff's awareness of the needs of visitors with disabilities.

### **Borrow Pit, Spoil, and Mining Site Management**

Mount Rainier National Park has one active and eight inactive gravel pits within its borders. There are also ten abandoned mined sites in the park.

All materials from borrow pits, quarries, and other gravel or sand sources in Mount Rainier National Park will be managed according to Chapter 9.1.3.3 of the *NPS Management Policies 2001* (NPS 2001b). All sources, both existing and future, will comply with the National Environmental Policy Act (NEPA), including written findings that the extraction and use of borrow material does not, or will not, impair park resources or values and is the park's most reasonable alternative, based on economic, environmental, or ecological considerations.

A diverse interdisciplinary group will develop a parkwide borrow management plan and will make determinations based on specific proposals. The use of such material will be strictly for in-park administrative use by the Park Service or its agent or contractors. Borrow

material extracted from proposed or designated wilderness areas will be taken only in small quantities to be used for trail-type activities. For all existing and proposed borrow pits, a quantity of extraction will be specified and a restoration plan will be prepared according to the NEPA process.

All spoil sites within the park will be designated in writing and will meet the definition and regulatory requirements for solid waste disposal sites in accordance with 36 CFR 6. New spoil sites or the expansion of existing spoil sites will be analyzed through the NEPA and National Historic Preservation Act (NHPA) processes. In addition, the park staff will comply with NPS solid waste regulations and other specific NPS requirements.

Any mining site within the boundaries of Mount Rainier National Park will be documented and analyzed through the NEPA and NHPA processes for inclusion as a significant cultural resource or possible reclamation, depending on the findings of its significance. All site reclamation will depend on the development of a preferred alternative based on economic, environmental, or ecological considerations.

### **Sustainability**

Sustainability can be described as doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices consider local and global consequences to minimize the short- and long-term environmental impacts of human actions and developments through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques.

Over the past several years the federal government has been emphasizing the adoption of sustainable practices. In particular, Executive

Order 12873 mandates federal agency recycling and waste prevention, and Executive Order 12902 mandates energy efficiency and water conservation at federal facilities.

The following strategies will help ensure that all decisions regarding park operations, facilities management, and development in Mount Rainier — from the initial concept through design and construction — reflect the principles of resource conservation. Thus, all park developments and park operations will be sustainable to the maximum degree possible and practical.

- The reduction, reuse, and recycling of materials will be promoted; the use of materials that are not durable, are environmentally detrimental, or that require transportation from great distances will be avoided as much as possible.
- The rehabilitation (recycling) of existing buildings and facilities will be preferred over new construction, except where compelling reasons determine it is not feasible.
- New developments or modifications of existing facilities will be located and built following the *Guiding Principles of Sustainable Design* (NPS 1993a) or other similar guidelines.
- The park staff will support and encourage suppliers, contractors, and concessions that follow sustainable practices.
- Partnerships will be sought to implement sustainable practices in the park.

### **IMPLEMENTATION OF THE APPROVED PLAN**

The implementation of the approved plan will depend on future funding. Plan approval does not guarantee that the money needed will be

forthcoming. Full implementation of the approved plan could be many years in the future.

The implementation of the approved plan also could be affected by other factors. Mount Rainier is in an area where geologic forces are continuing to shape the landscape. It is not possible to plan for these changes during the life of the plan. However, if a major geologic event occurred, such as a mudslide or flood, the National Park Service would reexamine its goals for the affected area, including zone prescriptions, uses, and infrastructure, and amend the plan accordingly.

Once the *General Management Plan* has been approved, additional feasibility studies and more detailed planning and appropriate environmental documentation may be required before any proposed actions can be carried out.

In addition to the plans and studies identified in the "Guiding Management Principles and Strategies" section, a number of other studies and plans would be prepared following the approval of a general management plan. These more detailed plans would tier off this plan, describing specific actions managers intend to take to achieve desired conditions and long-term goals. Some of these implementation plans are prepared for parks in response to NPS policies, such as a commercial services management plan and an interpretive plan.

- The park's wilderness management plan (NPS 1992c) would be updated to be consistent with the approved general management plan and to reflect changes that have occurred in the uses and management of the wilderness area. Indicators and standards in the wilderness management plan may also be revised, and day use limits could be proposed.
- A commercial services plan would be prepared to address the primary commercial activities at Mount Rainier, includ-

ing food and lodging, gift sales, climbing, wilderness/nonclimbing trips, road-based tours, interpretation, transportation, winter use, commercial filming, and emergency services. The commercial services plan would provide direction on such topics as how commercial climbing would be managed (contracts, permits, or some combination); what levels of use would be appropriate for commercial wilderness trips; and how conditions on commercial activities could alleviate parking problems.

- In 1989 it was determined that 9 miles of the West Fork of the White River, 6.7 miles of the Muddy Fork of the Cowlitz River, 12.7 miles of the Ohanapecosh River, and 8 miles of the Carbon River were eligible for inclusion in the national wild and scenic rivers system. The U. S Forest Service also has found that downstream segments of these rivers are eligible. The Park Service would work with the Forest Service in preparing a suitability study to determine whether these rivers should be recommended for congressional designation and inclusion in the system.
- As funds became available, cultural landscape reports would be prepared for the entire national historic landmark district, including all areas where changes are being proposed to roads and parking areas (such as Paradise, Sunrise, Mowich, Carbon River, Westside Road), and for minor developed areas (for example, Tipsoo Lake, Box Canyon, Reflection Lake, Grove of the Patriarchs). The reports would address specific site design needs and guide the historic preservation, rehabilitation, and restoration of these areas.
- A transportation plan would examine different options for improving visitor transportation within the park (see the preferred alternative for more details on this plan).

- A road pullout study would determine which pullouts along park roads were needed and which should be eliminated. Informal parking pullouts would also be studied and recommendations made about whether to formalize these parking pullouts.
- Impacts from the increased winter use, such as sanitation problems, are occurring at Paradise. However, the park staff does not have information on the magnitude and severity of these impacts, nor is there

information on visitor distribution patterns or the experiences visitors are seeking. A winter use study would be prepared to provide this information. The study would set a baseline and determine whether or not a winter carrying capacity needs to be set for Paradise. In addition, the study would provide a basis for determining what management actions could be undertaken to address visitor needs and protect resources, thereby enhancing the overall visitor experience.

## SCOPE OF THIS DOCUMENT

As we enter a new millennium, the American public and the National Park Service need to make many important and often difficult decisions about the future of Mount Rainier — its resources, uses, and management. What conditions should the Mount Rainier Wilderness be managed for? What should be done to ensure that the park's resources are protected for present and future generations? How should the National Historic Landmark District be preserved and interpreted? What levels and types of use are appropriate for the park?

These are complex issues, with no easy answers. People who care deeply about this park often hold sharply divided opinions about how the National Park Service should resolve the issues. In addition, tight budgets combined with increased visitation have put an increased strain on the National Park Service's ability to maintain facilities, to protect natural and cultural resources, to provide interpretive and other visitor services, and to enforce rules and regulations. Thus, there are concerns regarding whether or not the National Park Service can fund and staff new proposals to resolve problems resulting from increased visitation.

The breadth of issues and concerns facing Mount Rainier illustrates the complexity and difficulty in determining how to manage park resources and visitors in the 21st century. This plan focuses on three major resource and visitor use management issues: wilderness use, use of the nonwilderness area; and external boundary issues. This section describes each of these major issues. Many questions have been raised regarding these issues by the planning team and the public. For each issue some general background is provided, specific concerns are noted, and then major decision points and tradeoffs are identified.

There are also a few issues related to geological hazards that this plan will not fully resolve,

along with issues and implementation strategies needing more detailed planning, such as commercial services, wilderness management, and interpretive services. In addition to the major issues discussed below, the alternatives also address a number of other minor issues and topics.

Although important for the future park management, the strategies to resolve these issues are not controversial and do not appear to involve major tradeoffs. These issues and topics include the need for additional natural and cultural resource inventories and monitoring; the need to cultivate special awareness and sensitivity among park staff, concessioners, and park visitors regarding the National Historic Landmark District; improving camping facilities at Mowich Lake; improving the existing interpretation and education exhibits and facilities; fostering better relations with partners outside the park boundary; and providing additional picnicking facilities.

### WILDERNESS ISSUES

Ninety-seven percent of Mount Rainier National Park is wilderness (see Existing Conditions map). The Wilderness Act directs the National Park Service to protect and manage wilderness so that it “generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable,” and so that it “has outstanding opportunities for solitude, or a primitive and unconfined type of recreation.”

**Issue 1.** The large numbers of people visiting the wilderness are degrading and damaging resources.

High visitor encounter levels are occurring in the Mount Rainier Wilderness in many areas of the park, including Spray Park, Comet Falls,

Snow/Bench Lakes, Summerland, the Muir corridor climbing routes, and at Glacier Basin. Much of the visitor use in these areas is day use. Overnight use is being managed in the wilderness area under a permit program, but day use is unlimited. Standards have been defined for wilderness in the *Wilderness Management Plan* (NPS 1992c) and are being implemented with limited funding and staffing. However, damage from recreational activities is still occurring.

Visitor behavior can directly or indirectly affect plant and wildlife species and their habitats, including threatened and endangered species such as the northern spotted owl, marbled murrelet, and bull trout. Large numbers of visitors in popular areas such as Spray Park have trampled vegetation, resulting in extensive areas of bare ground and eroded soils. This erosion can lead to diminished water quality in the park's lakes and streams. Dust, sedimentation, and runoff from nearby nonwilderness access roads and parking areas also threaten the water quality of the wilderness in areas like Mowich Lake. In addition, in some areas visitors are trampling vegetation when they hike and camp in alpine and subalpine areas, which is resulting in inadvertent damage to wilderness resources.

**Issue 2.** Public views differ on what visitor experiences are appropriate in the Mount Rainier Wilderness.

The Wilderness Act directs the National Park Service to provide a certain type of experience in wilderness areas. However, there is substantial disagreement both in the literature interpreting the Wilderness Act and in the comments the planning team has received from the public regarding what this experience truly means, especially in regard to interpreting the meaning of "outstanding opportunities for solitude, or a primitive and unconfined type of recreation." On the one hand, some people state that opportunities for solitude should exist everywhere in the wilderness and at all

times, not just for those with the ability to hike off trails or for those who can come during less busy times. Some people are bothered so much by the large numbers of hikers and climbers that they choose to go to other parts of the park, or they may even not visit the park. On the other hand, some people say that with a little effort, opportunities for solitude abound. Others believe many visitors hike or climb to seek "challenge and beauty" in an unconfined and pristine setting, and they are not bothered by larger numbers of people at certain times and places.

### **Major Wilderness Decision Points.**

Wilderness Carrying Capacity — What conditions (experiences, recreational uses, resource conditions) should the Mount Rainier Wilderness be managed for? If visitor behavior is not skillfully managed, it is likely that resource damage would increase, and opportunities for solitude would decline in some areas. If day or overnight use is restricted or regulated, resources could be better protected, but visitors would have less freedom to go where they wish and when they want to, and they may be displaced from the park.

### **ISSUES RELATING TO THE NONWILDERNESS AREA**

About 3% of Mount Rainier is nonwilderness and is also part of the Mount Rainier National Historic Landmark District. This includes the developed areas and road corridors. In the 1920s and 1930s the historic road system that winds through the park was intentionally planned to afford fantastic views of the scenery, to limit landscape damage and development, and to allow visitors access to the wondrous areas of the park. These roads connect the primary destinations in the park, including Longmire (the oldest developed area in the park), Paradise, Sunrise, Ohanapecosh, Carbon River, and Mowich Lake, as well as the many minor developed areas in between.

Most changes that have been made to the park's developments over time have occurred in response to rising visitation. Originally, a single road led to Paradise. In 1958 a new, two-way road was built to Paradise from near Narada Falls. The old approach road became part of the present Paradise Valley Road, which was intended to help reduce congestion, improve safety, and to make it easier for park crews to remove extensive volumes of snow. At that time, the circulation pattern was changed. Most visitors now leave Paradise the same way they drove up, along the new road segment. However, if the area is congested, then some visitors leave Paradise along what was originally designed as the scenic approach drive (the Paradise Valley Road).

**Issue 3.** In the summer people are concentrated in a few areas of the park, such as Paradise. Off-trail use in these areas results in trampling of sensitive vegetation.

As the population in the surrounding region grows over the next 20 years, visitation to Mount Rainier will probably increase. Much of this use will continue to be concentrated in the park's nonwilderness areas where resource damage and congestion are already occurring. When visitors cannot park in lots, they often park along nearby road shoulders. In some places this causes safety hazards, damages plants, and compacts soils. In areas of concentrated visitor use, those seeking to escape crowded trails create "social" trails. These social trails contribute to other bare ground and can take many years to recover. This is especially true for the sensitive alpine and subalpine meadow environments in the Paradise, Sunrise, Tipsoo Lake, and Mowich Lake areas. Although the park's model restoration program has restored many portions of damaged meadows and other areas, still more areas need attention. In addition, restoration work is labor intensive and requires a considerable investment by the park staff every year. Unless visitor use patterns change, restoration work

must continue to occur in order for the National Park Service to meet its resource preservation mission at Mount Rainier.

**Issue 4.** On peak summer days vehicle congestion at park entrances, at parking areas, and at wilderness trailheads continues to adversely affect the quality of the visitor experience for many people.

Visitor surveys have indicated that uncongested traffic conditions on park roads and the ease of finding parking are two of the more important aspects of a quality visit. But during peak weekend hours visitors often find that the park entrances and parking areas are severely congested. So many visitors enter the park through the Nisqually, White River, and Stevens Canyon entrances that long lines of vehicles are often present during peak periods.

Increasingly, vehicles fill parking areas on sunny summer weekend days and holidays. Severe parking congestion occurs at Paradise, Sunrise, Longmire, Ohanapecosh, Tipsoo Lake, Mowich Lake, and Carbon River areas, as well as at campgrounds, trailheads, and viewpoints throughout the nonwilderness area. As a result, visitors often resort to parking anywhere they can find a spot, sometimes more than a mile away, and then walk along narrow, congested roads to their destinations.

Traffic congestion and overflow parking increase the chance of accidents, especially between pedestrians and motor vehicles. Park facilities, including buildings and trails, may also become overcrowded. Similarly, wilderness trailhead parking areas are usually filled to capacity on summer weekends and holidays, affecting the ability of visitors to access these trails and enjoy an uncongested experience. When visitors find full parking lots, they either park illegally or change their plans and hope to find an empty parking space at another trailhead. It is likely that in the future it will become increasingly difficult during the peak

visitor use season to find parking spaces and enjoy areas such as Paradise and Sunrise.

**Issue 5.** There are many park and visitor use activities that potentially can affect the historic integrity of the National Historic Landmark District.

The historic character of the national historic landmark district is comprised of many structures and character-defining features that retain historic integrity, contribute to, and convey the historic significance of the landscape. There is a risk that individual, seemingly minor alterations to components of the district could result in a large and harmful cumulative effect on these resources. Increasing visitor use, structural deterioration resulting from age and climatic conditions, and the fiscal constraints faced by park managers (who must balance the preservation requirements of numerous resources) all affect future preservation of the district. Because the designation is so recent, many visitors and park employees are not aware of the importance of these areas.

**Issue 6.** Park geologic hazards, such as avalanches, debris flows, glacial outburst floods, and rockslides, threaten visitors, employees, and developed areas.

The primary volcanic hazard at Mount Rainier is from debris flows — an avalanche of mud and other debris, resembling masses of wet concrete, that flow downslope along channels or stream valleys, often at high speed. Small debris avalanches occur in the park at intervals ranging from yearly to more than 100 years. These debris flows can occur without warning and would likely result in the loss of life and property. Many of the developed sites in Mount Rainier are located on historic debris flow deposits in valley bottoms, and 17 of 23 developed sites in the park are within mapped debris flow hazard zones. Other potential volcanic hazards associated with an erupting Mount Rainier include pyroclastic flows, ash fall, and lava flows. Other geologic hazards

visitors and employees face at Mount Rainier include rockfalls, landslides, and snow avalanches.

**Issue 7.** Emissions from external sources are threatening the park's air quality, while campfires and vehicles within the park are degrading air quality in localized areas.

Degraded air quality could damage vegetation, soils, and water quality. Research and monitoring studies have shown that the park's air quality is being visibly affected by emissions, especially from sources outside the park. Recently, park staff participated in an effort to reduce emissions from the nearby Centralia power plant and thereby improve the park's air quality.

Additional measures also need to be taken to address emission sources within the park. The smoke from individual campfires can be so thick in places that it affects scenic resources. The particulates emitted from this smoke can affect air quality and pose a health hazard to visitors and park staff. Vehicular emissions also may lead to degraded air quality.

**Issue 8.** There are strongly differing agency and public opinions on whether or not Westside Road and Carbon River Road should be repaired and whether or not Westside Road should be reopened to private vehicles.

Westside Road was designed to provide access to the southwest corner of the park. However, in the 1960s recurrent flooding damaged the road. Glacial outburst floods are expected to occur for about the next 20 years. As the glacier recedes, more eroded material will be available to wash downstream and damage or destroy the road.

In 1992, pursuant to an evaluation of glacial outburst flooding done by the U.S. Geological Survey and documented in a subsequent environmental assessment, the National Park Service decided to keep most of Westside

Road closed for the foreseeable future. A reevaluation of the road closure would be done every three years, pending a change in the predicted frequency of glacial outburst flooding. This decision was made partly because of the cost of either continually repairing flood damage or rerouting the road, as well as because of potential impacts on visitor safety.

Currently, visitors can drive a short way up the road, but then they must hike, bicycle, or ride horses along the rest of the road. Although many visitors see this as an inconvenience, others who have made the effort have enjoyed the greater solitude found in this part of the park. The closure of this section of the road may have redistributed visitor use toward Paradise and Sunrise, where visitors can more easily experience subalpine meadows and hike with small children.

A large stretch of Carbon River Road has been repeatedly damaged by floods. The flood damage in 1996 was recently repaired. Within a month of being repaired, a flood again eroded the same section of the road, although to a lesser degree. During the time the road was closed to motor vehicles, some visitors enjoyed the 5-mile bicycle ride or hike to the campground; many others saw this closure as an inconvenience, particularly families with children, school groups, and the physically less fit. An economic study, completed for the environmental assessment to repair the road (NPS 1998a), analyzed the costs. Questions have been raised about the cost of maintaining a roadway located in a floodplain. (Although most park roads follow river corridors, for the most part they are outside of the 100-year floodplains.)

**Issue 9.** Prearrival visitor information, orientation to the park, and interpretive exhibits and programs are not adequate for resource protection and visitor enjoyment of the park.

Visitor information services play a vital role in resource protection and visitor enjoyment. Visitor contact stations provide important trip planning information, including safety messages, user permits and reservations, information on significant park resources and their protection, and information on regional and park recreational opportunities. As popular park areas become more crowded and the logistics of accessing the park become more complex for visitors, the location, number, and size of visitor contact facilities inside and near the park, along with the variety of visitor services they provide, help determine the quality of the visitor experience.

In any season, very little information is available to visitors before they get to the park. Although visitors are usually greeted by a ranger and given some basic information at the Nisqually, Stevens Canyon, and White River entrance stations, visitors are not formally greeted at most approaches into the park, including the Carbon River entrance, Mowich Lake Road, Washington State Routes 123 and 410, and U.S. Highway 12. The exhibits at the Longmire museum and the visitor centers at Paradise, Ohanapecosh, and Sunrise are very old and do not adequately convey the purpose and significance of the park or its important stories to visitors (such as the fact that visitors play an important stewardship role in protecting resources).

The media and range of services provided in existing visitor contact facilities are outdated and are not adequately conveying a resource protection message. Visitor information services also do not meet current interpretive standards, park management objectives, or the expectations of park visitors.

**Issue 10.** The National Park Service is under continual pressure to open up more roads in the winter so that visitors can enjoy more of the park. But opening more roads would be very costly and would pose safety concerns and increase the potential for resource impacts

(that is, enhanced road access in the winter might diminish the available winter habitat for big game species).

The only roads in the park that are open year-round are the Nisqually to Paradise Road, State Route 123 from U.S. Highway 12 to Ohanape-cosh, and usually Carbon River Road. When the Nisqually to Paradise road is closed at the Longmire gate, visitors may wait at Longmire for hours while avalanche hazards are assessed and the road and parking areas at Paradise are made accessible. Other roads are not plowed in the winter, primarily because of the cost, safety, and resource concerns of clearing additional large volumes of snow.

Interest is growing in increasing vehicle access to more of the park in winter, particularly along State Route 410. The Washington State Department of Transportation once plowed the north section of State Route 410 over Cayuse Pass and State Route 123, but stopped plowing in the early 1970s primarily because of funding constraints.

**Issue 11.** There are differing views regarding winter recreational uses. Questions have been raised about whether or not the managed snow play (sledding) area at Paradise should continue and, if it continues, should it continue as a managed area? Other issues include whether or not snowmobiles should be permitted in the park, and where and how much winter camping should be permitted.

In winter, visitors cross-country ski, snowshoe, winter camp, and snowboard in Mount Rainier. Within the region, Paradise is often the first area to get snow, usually before the ski resorts open, which attracts snowboarders and others to the area. Much of the park's winter use occurs at Paradise, with Mowich Lake, Carbon River, White River, and Ohanape-cosh being used far less.

Snow play is a historic use of the park. Although the Paradise snow play area is

enjoyed by many visitors, questions have been raised about the appropriateness of this activity because opportunities for snow play exist outside the park. Because sledding and sliding potentially can harm vegetation, sufficient snow depth is required to prevent damage to park vegetation. Resource damage is particularly an issue during spring melt-out, when patches of snow reveal the sensitive subalpine meadow. In addition, there are several snow play accidents a year, and creating as safe an environment as possible for this activity requires a substantial investment of park resources (money and staff).

Snowmobile use has been allowed in certain areas of the park, but eliminating snowmobiles is being proposed for reasons of resource protection, compatibility of visitor uses, and compliance with law. There was very little snowmobiling in any of the areas where snowmobiling was permitted, in part because the designated routes are so short. Where it did occur, snowmobiling could adversely affect some wildlife and visitors (such as cross-country skiers or snowshoers) seeking quiet and solitude in the park.

#### **Major Nonwilderness Decision Points.**

Visitor Carrying Capacity for the Nonwilderness Area — What visitor experiences and resource conditions should be maintained in the park's nonwilderness area? How can visitor use be managed to minimize resource impacts and still ensure quality visitor experiences? Should visitor carrying capacities be set for Longmire, Paradise, Sunrise, Carbon River, and the Mowich Lake areas? If new management zones and standards were established, they could either positively or negatively affect the experience of visitors or the quality of resources. If use was limited in one area, and visitors were displaced, other areas within or outside the park could receive higher use levels and more resource impacts.

If more visitor facilities, such as picnic areas, were added, the park could accommodate more

visitors, but there also would be a greater potential for resource impacts. Changing visitor activities, such as eliminating campfires or reducing the number of vehicles in the park, could reduce resource impacts but could also detract from visitor enjoyment. Snow campers would be affected if snow camping at Paradise, as well as other areas in the park, was increased or decreased. (Ties to issues 3, 4, 5, 7, 8, 10, and 11.)

Visitor Congestion — How can visitor congestion be reduced on Mount Rainier's roads, in parking areas, and at entrances? Different techniques can be employed, such as initiating a shuttle system, changing traffic flows, eliminating overflow parking, and establishing vehicle limits and parking reservations based on the ability of the resources and facilities to accommodate use. Employing these methods would help the National Park Service better meet desired conditions and carry out its mission to provide for visitor enjoyment while protecting resources. But some of these techniques could be costly, both to the National Park Service and to visitors.

Stronger management controls could improve resource conditions and visitors' experiences, but they could also detract from visitor enjoyment and freedom to do what they want, and go where and when they want. Implementing stronger controls could greatly inconvenience some visitors, especially if they had to wait a long time or were unable to find a parking space. Although visitor convenience is important, so is respecting the historic integrity of cultural resources such as the National Historic Landmark District and the protection of natural resources. (Ties to issue 4.)

Geologic Hazard Risk Management — Mount Rainier poses considerable geologic hazards to park visitors, employees, and facilities. Sometime in the relatively near future there will be a geologic event, such as a debris flow, that could result in the loss of life or property in the

park. Is the potential risk for the loss of life and property great enough to warrant the closure and relocation of visitor and administrative facilities? What should park managers do, if anything, from a visitor preference, public safety, legal, and moral/ethical viewpoint? On the one hand moving visitor facilities such as the White River campground would not only be unpopular among visitors, but would be costly. On the other hand doing nothing could have far more serious costs sometime in the future. (Ties to issue 6.)

Mowich Lake Area — The use of Mowich Lake, the parking area, and the camping area have adversely affected the lake environment, which is in wilderness. How should the Mowich Lake area be managed so as to protect aquatic resources and wilderness values while providing for visitor enjoyment? If vehicles were removed from the Mowich Lake watershed to protect the lake's ecology, visitors who cannot walk the increased distance to the lake might not be able to enjoy this area. How can erosion, stormwater runoff, sedimentation, and dust from the road near Mowich Lake and the parking lot be reduced? What improvements can be made to reduce user-caused damage to vegetation around the lake? Should scarce funds be devoted to designing a new campground that would both improve the experience for visitors and better protect the lake environment? (Ties to issue 4.)

Westside and Carbon River Roads — Should Westside Road be reopened partly or fully for public use? Reopening Westside Road to motor vehicles would enable many more people to visit this part of the park. However, this could also increase resource impacts and reduce opportunities for solitude. Keeping both roads open could be very costly when additional flooding occurs. As with other drainages in the park, flooding and geological hazards could strand or harm many visitors within the path of these events. Should both roads, or a portion of the roads, become trails for nonmo-

torized use? If the roads were permanently converted to trails, what activities should be permitted? What should the park staff do in the case of conflicts between hikers, bicyclists, and horseback users? (Ties to issues 4 and 8.)

Visitor Information Services — Should additional funds be dedicated to expanding visitor information services? Where and how should pre-trip information, orientation to the park, and interpretation of its resources, be provided? What improvements should be made to reduce resource impacts and help visitors know ahead of time what to expect? Should information services be improved by renovating or expanding services and facilities inside the park, by expanding services outside the park, or by a combination of methods? Adding new facilities at strategically located areas leading to the park and improving information services inside the park would help increase the effectiveness of the program, but would also drain the limited NPS financial resources. (Ties to issue 9.)

Winter Snow Play — Is snow play an appropriate use in Mount Rainier National Park? If so, where should it be permitted? Can it be managed to limit impacts on resources and on other visitors? Prohibiting snow play would help protect resources and save NPS resources (i.e., money and staff). But prohibiting this use would reduce the range of experiences offered in the park. (Ties to issue 11.)

Winter Access — Should the National Park Service open up more roads in the winter, particularly State Route 410 to Cayuse Pass, State Route 123, Westside Road, and the road to Mowich Lake? Could improvements be made in how visitors get to Paradise? Providing additional access would allow more people to enjoy more of the park in the winter, but it could also increase resource and wilderness impacts, and affect people seeking solitude and a primitive recreational experience. Should visitors be able to continue driving to Paradise? If so, could improvements

be made to how visitors get there in their own vehicles, or would a shuttle help get visitors there sooner or more visitors get there? (Ties to issues 10 and 11.)

## EXTERNAL BOUNDARY ISSUES

Eighty-three percent of Mount Rainier National Park is within Pierce County; the rest is within Lewis County. Yakama County borders a part of the park's eastern boundary, and the park is about 15 miles from King County. As previously described, much of the park is surrounded by three national forests and several associated wilderness areas – the Mount Baker-Snoqualmie National Forest (with the Clearwater Wilderness to the north and the Glacier View Wilderness to the west), the Wenatchee National Forest (with the William O. Douglas Wilderness to the east), and the Gifford Pinchot National Forest (with the Tatoosh Wilderness to the south).

Although the purposes of these national forests differ from those of Mount Rainier National Park, and although Forest Service management practices differ from those of the National Park Service, the national forests have helped protect park resources and views to and from the park. Most national forest lands adjacent to the park are expected to continue to be managed in accordance with current wilderness and management plan designations, which are compatible with the park.

Privately owned lands also border the northwest corner of the park, the approach road leading to the Carbon River area, and parts of the western boundary. Timber harvests will occur in these areas in the future.

**Issue 12.** Park visitors, developments, and management activities are affecting adjacent landowners, and activities outside the park boundaries are, in turn, affecting park resources and visitors.

Mount Rainier is a historic and wilderness park in a rapidly urbanizing region. Nearby communities are continuing to expand. The local communities surrounding the park are very much influenced by what happens within the boundaries of Mount Rainier. Some communities are realizing greater seasonal sales and tax benefits from tourist-related expenditures. However, continuing increases in tourism in the park and surrounding area could result in traffic congestion, demand for additional commercial services, and an overload of existing community infrastructure. As a result, the rural character of surrounding communities could change.

Timber clearcutting practices on nearby private and U.S. Forest Service lands have affected views from the park, particularly on the west and north sides of the park. The park's boundary is now clearly visible from space due to timber harvesting. In addition, timber harvests may be affecting park wildlife populations, including threatened and endangered species.

Other activities on adjacent U.S. Forest Service lands also are affecting the park. The proposed expansion of the Crystal Mountain ski area (part of the Mount Baker-Snoqualmie

National Forest on the northeast corner of the park) is expected to substantially increase use in the area, some of which will likely overflow into the park. In addition, the use of trails that connect national forest lands with the park, such as the Pacific Crest Trail, is affecting both agencies. Coordination among different land managers can sometimes be difficult because each agency has its own set of goals and management practices.

**Major External Boundary Decision Points.** Viewshed and Resource Protection along the Park's Northwest Corner — What land protection strategies should be pursued to help protect views and resources in the northwest corner of the park? If willing sellers exist and Congress approves, the National Park Service could seek to expand the park's boundaries. But this can be an expensive and lengthy undertaking. Other land protection strategies could be pursued, such as encouraging the U.S. Forest Service to acquire lands as part of a land exchange, or the National Park Service or the Forest Service could acquire conservation easements. But these strategies could also be expensive and might not afford adequate protection. (Ties to issue 12.)

## RELATIONSHIP TO OTHER PLANNING EFFORTS

Several plans have influenced or would be influenced by the approved general management plan for Mount Rainier. These plans have been formulated by the National Park Service, U.S. Forest Service, regional and county agencies, and site developers. Brief descriptions of these plans are provided in appendix B. Other existing and ongoing environmental assessments besides those in the appendix, such as the *Carbon River Road Reconstruction Environmental*

*Assessment* (NPS 1998a), also affect management and developments in the park. These documents are on file at the park headquarters. Several plans for developments outside the park, such as the Mount Rainier Resort at Park Junction, are described in “Actions Considered in the Cumulative Impact Analysis” in the “Environmental Consequences” chapter.

PURPOSE OF AND NEED FOR THE ACTION

(blank)



# **Alternatives, Including the Proposed Action**



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## INTRODUCTION

This chapter presents three alternatives or approaches for managing Mount Rainier National Park. Alternative 1, the no-action alternative (continue current management), describes existing management of the park to provide a baseline for the other alternatives. Alternative 2 is the National Park Service's preferred alternative. It would provide a comprehensive approach with emphasis on resource protection while providing for additional visitor use opportunities. Alternative 3 would provide more opportunities for visitor use in different ways from alternative 2, while also ensuring resource protection. Alternatives 2 and 3, which are referred to as the action alternatives, establish different visions for how Mount Rainier National Park could be managed in the future. They focus on what resource conditions and visitor experiences should be, rather than on exactly how those conditions or experiences would be achieved. Therefore, the alternatives do not describe specific facility locations or designs, nor do they present specific visitor use management techniques.

Each action alternative

- describes the desired conditions (zoning) for the park
- describes general actions that would be taken both parkwide and in different parts of the park
- recommends a potential boundary adjustment
- discusses implementation and cost implications

The management actions for each alternative are presented geographically — parkwide, the south area (including Westside Road, Longmire, Ricksecker Point, Paradise, and

Ohanapecosh areas), the northeast area (including the White River and Sunrise areas), and the northwest area (including the Mowich and Carbon River areas). In some areas management approaches would differ seasonally, so actions are presented for summer or winter. Because no major changes are proposed in the minor developed areas in the park, such as Tipsoo Lake, Box Canyon, Reflection Lake, and Grove of the Patriarchs, these areas are not discussed separately in the alternatives.

Unless stated otherwise, all current uses and facilities would continue in all of the alternatives. Also, if changes in management actions are not discussed, then future management would be similar to existing management.

At the end of this chapter, common mitigating measures that would be taken to reduce the intensity of impacts under the action alternatives are described. This is followed by a brief description of the actions and alternatives that were considered by the planning team but dropped from further analysis for various reasons. Following that are three tables that summarize the alternatives, the important differences among them, and their impacts.

In developing the alternatives, several assumptions were made by the planning team. These assumptions underpin the alternatives. They are considered “givens” for how the park will be managed in the future under all of the alternatives.

- No major new developments, including campgrounds, parking areas, lodges, roads, and visitor centers (aside from replacing the Henry M. Jackson Memorial Visitor Center in alternative 2) would be built within the park's existing contiguous boundaries.

- The major activity centers, including Longmire, Paradise, Ohanapecosh, White River, Sunrise, Mowich Lake, and Carbon River, would continue to be maintained and would attract the majority of visitors.
- Minor developed areas would remain. Aside from changes that would improve the visitor experience in these areas, such as refining trail access, adding signs and parking, and adding vault toilets, no major changes are proposed.
- Recent decisions or proposals would continue to be implemented, including the following:
  - building an environmental education center at Tahoma Woods
  - rehabilitating and replacing interpretive exhibits throughout the park, in accordance with the “Long-Range Interpretive Plan” (NPS 2000a); a major rehabilitation or replacement of the audiovisual programs and exhibits would occur in the Paradise, Sunrise, and Ohanapecosh Visitor Centers, the Longmire Museum, and in the White River, Wilkeson, Longmire, and Paradise Wilderness Information Centers; wayside exhibits throughout the park would also be replaced
  - moving some operational/nonemergency response functions from Longmire to Tahoma Woods
  - replacing the nonhistoric fee booth at the White River entrance with two booths.
  - building a new permanent collection storage facility at Tahoma Woods to ensure long-term preservation, to accommodate expansion of the collection, and to encourage increased use of the collection by researchers and the public; the environmental analysis for this facility and for the new environmental education facility would be completed later
  - replacing the Sunrise Lodge with a ranger/concession facility, and the Sunrise campground would be restored to a natural condition, as called for in the *Sunrise Development Concept Plan / Environmental Assessment* (NPS 1992b)
- The population of the Puget Sound region, as well as park visitation, would continue to grow over the time horizon of this plan (20 years).
- The majority of visitors would continue to want to visit the park from June through October, primarily on good-weather weekends and holidays.
- As an active volcano, Mount Rainier would continue to pose a potential threat to visitor and employee safety and to park facilities.

## ALTERNATIVE 1: NO ACTION

This alternative provides a baseline for evaluating the changes and impacts of the two action alternatives. Under this alternative, Mount Rainier National Park would continue to be managed as it has in the past, relying on the “Statement for Management” (NPS 1988b), the *Wilderness Management Plan* (NPS 1992c), and other approved plans. The park staff would continue to respond to issues on a case-by-case basis. No major new construction projects would be undertaken, and major changes in management direction would not occur — current management practices would continue.

### CURRENT PARK ZONING

Under alternative 1 the guidelines and management zoning described in the “Statement for Management” (NPS 1988b) and in the *Wilderness Management Plan* (NPS 1992c) would continue to be followed. There are three management zone for the park’s nonwilderness areas and three for wilderness. Because it was not designated when these plans were developed, the existing National Historic Landmark District is treated as a zone overlying the underlying nonwilderness and wilderness zones.

#### Zone Definitions

**Non wilderness Zones.** There are three nonwilderness zones:

**Natural Zone** — The natural zone includes lands and waters managed to conserve natural resources and ecological processes and to provide for their use and enjoyment by the public in ways that do not adversely affect these resources and processes. Development would be limited to dispersed recreational and essential management facilities that have no adverse effect on scenic quality or natural

processes, and that are essential for management, visitor use, or the appreciation of natural resources. Examples of such facilities include trails, signs and trailside information displays, shelters, stream-gauging devices, and weather stations.

**Development Zone** — The development zone includes lands and waters managed to provide and maintain facilities serving park managers and visitors. It includes areas where park development or intensive use may substantially alter the natural environment or the setting for culturally significant resources. Impacts associated with such developments would be mitigated to the greatest extent possible. The development zone encompasses the facilities themselves and all associated lands directly modified as a result of their continuing management and use. Development zones would be restricted to the smallest area necessary to accommodate required development and use. Additional development zones would be established only after considering alternative sites (including locations outside the park and locations outside areas with significant natural and cultural resources) and alternative levels of use, facilities, and services.

**Special-use Zone** — This zone includes lands and waters that would continue to be used for activities not appropriate in other zones, such as the Nisqually River and Silver Springs dikes, the snow play area, a telephone cable corridor, and radio antennas.

**Wilderness Zones.** The lands and waters in wilderness zones are congressionally designated wilderness, and they are managed in accordance with the 1964 Wilderness Act, the Washington Park Wilderness Act of 1988 (which established the Mount Rainier Wilderness), and NPS *Management Policies* (NPS 1988a). Development would be minimal in all wilderness zones. Trails and primitive

campsites would be maintained, along with ranger patrol cabins, shelters, and fire lookouts.

The *Wilderness Management Plan* (NPS 1992c) is based on the goals stated in the documents above for managing the wilderness, consistent with legal and policy requirements. The 1992 plan establishes three wilderness zones: trail, cross-country, and alpine zones. The plan describes the types of structures allowed in wilderness, standards for resource and social conditions, and standards for administrative use and management. As described below, varying degrees of challenge and opportunity for solitude are provided by the three zones. (Full zone descriptions are provided in the *Wilderness Management Plan*.)

Trail Zone — The trail zone includes durable and well-maintained trails that provide for easy access to wilderness by large numbers of visitors at any one time, with impacts concentrated along the trails and camping permitted only at designated campsites. During the peak season this zone would likely provide only limited opportunities for experiencing solitude; and overnight use is limited to 12 people for group campsites and 5 people for individual campsites. From October through May, or when snow depth exceeds 2 feet, group size is limited to 12 people per site. There are no limits on day use. Stock use is permitted on specified trails and at specified camps.

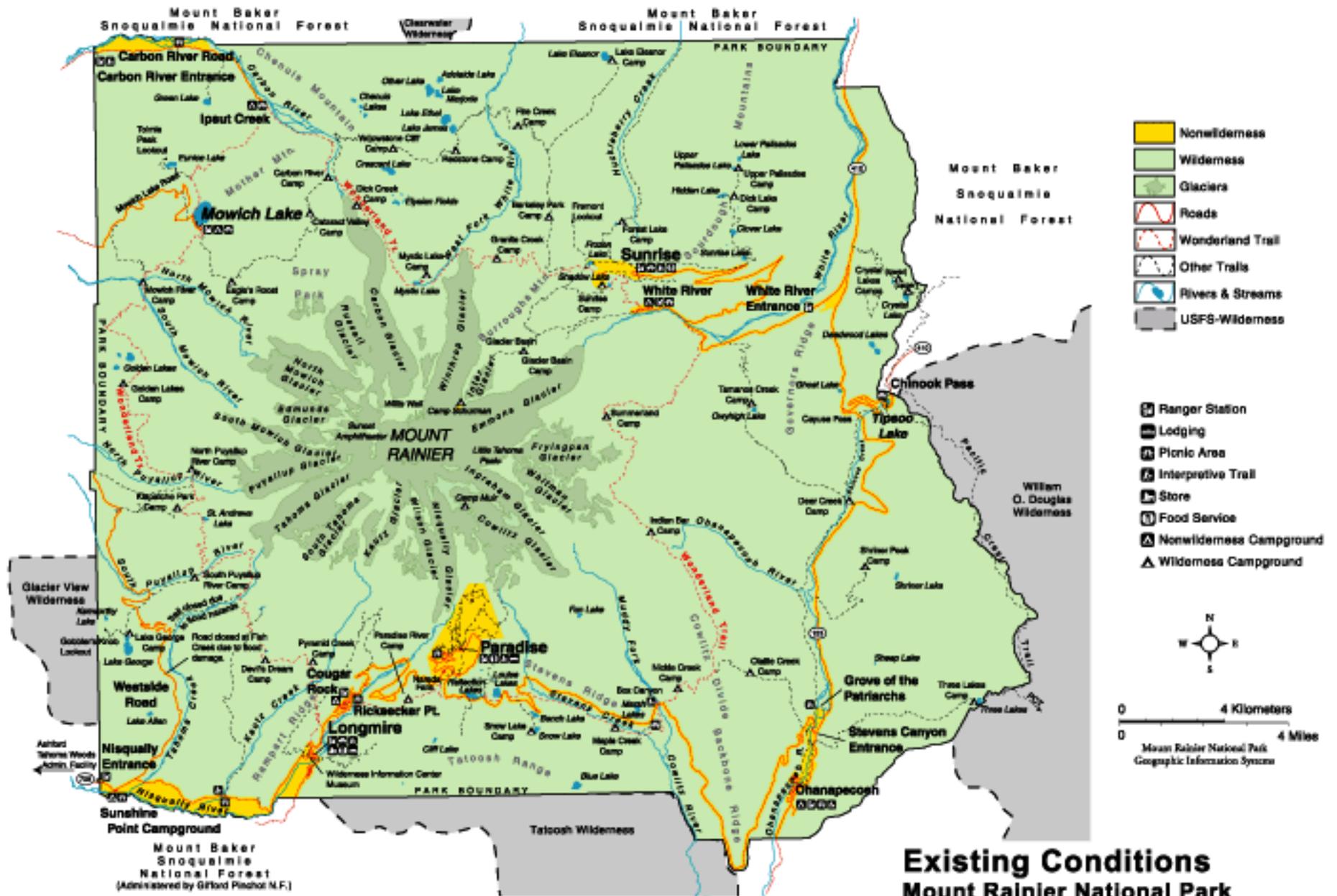
Cross-country Zone — Wilderness areas within this zone are more “pristine” than in the trail zone and offer visitors opportunities for challenge and solitude. Visitors are expected to use these areas without assistance, thus there are no signs, designated campgrounds, facilities, structures, or well-developed and maintained trails, although some areas may have narrow “way” trails. Users are encouraged to follow minimum impact techniques. The opportunity for experiencing solitude varies from moderate to high, but in most cases it is

likely higher than in the trail zone. During summer, or when snow cover is less than 2 feet, overnight camping groups are limited to 5 people. From October through May, or when snow depth exceeds 2 feet, group size is limited to 12 people. There are no limits on day use. Stock use is not permitted.

Alpine zone — Areas in the alpine zone provide for climbing and alpine hiking opportunities with a higher degree of challenge and experience than in the cross-country zone. With few exceptions, no designated trails exist in this zone, although some areas may have narrow “way” trails that lead to more heavily used vistas or climbing routes. Visitors are encouraged to camp on permanent snow or ice. They may also camp on bare ground areas that have previously been used as campsites. No camping is permitted on vegetated areas.

The construction of new campsites would not be allowed in the alpine zone, and the enhancement of existing sites with additional construction such as rock walls or windbreaks would not be permitted. The opportunity to experience solitude during the summer months ranges from high on the more remote or technically difficult climbing routes to extremely low on the more popular routes. Group sizes for public use are limited to 12 people when camping on snow and ice, and 5 people when camping on bare ground.

Concessioner-guided groups that pass through Camp Muir are limited to a total of 59 spaces for all climbing routes on any given night. This includes 35 spaces per night at Camp Muir (plus permanent camp staff members), 12 spaces per night on the Muir Snowfield (including guides), and 12 spaces on Ingraham Flats (including guides). This ensures that commercial groups that are camped will not exceed one-third of the total possible nighttime capacity. Stock use is not permitted.



**Existing Conditions**  
**Mount Rainier National Park**  
 U.S. Department of the Interior / National Park Service  
 DSC / AUGUST 2000 / 105 / 20,131

back of map

**National Historic Landmark District.** The Mount Rainier National Historic Landmark District overlies the development zone, but it also includes the Wonderland and Northern Loop trails and some structures in the wilderness area. All these lands within the National Historic Landmark District are to be managed for the preservation, protection, and interpretation of cultural resources and their settings and to provide for their use and enjoyment by the public. Development in the zone must be compatible with the preservation and interpretation of cultural values. Consistent with policies for the preservation and use of cultural resources, historic structures may be adaptively used for utilitarian or other purposes.

### Allocation of Zones

Because most of Mount Rainier National Park is congressionally designated wilderness (97% of the park, or 228,480 acres), the three existing wilderness zones cover most of the park, as shown in the Existing Conditions map. The allocation of both nonwilderness and wilderness zones is described below.

**Non wilderness Zones.** Application of the nonwilderness zones includes the following.

**Development Zone** — The development zone includes the following areas, covering a total of approximately 414 acres and associated roads and trails:

- *Longmire:* administrative offices, Longmire Museum, National Park Inn, old gas station, maintenance complex, park and concession employee residences, old (Macy) dormitory, community building, wastewater treatment plant, old campground, and various associated facilities.
- *Paradise:* Paradise Inn, Guide House, Henry M. Jackson Memorial Visitor Center, ranger station, park and concession

employee residences, wastewater treatment plant and associated facilities

- *Ohanapecosh:* ranger station, maintenance complex, visitor center, seasonal employee residences, campground, and wastewater treatment plant
- *White River:* entrance station, ranger station, seasonal employee residences, campground, and small maintenance facility
- *Sunrise:* visitor center, Sunrise (day) lodge (i.e., ranger station and concession building), park and concession seasonal employee residences, and related facilities
- *Carbon River:* entrance station, ranger station, old employee residences, associated storage and maintenance facilities
- *Nisqually:* entrance station, employee residences, administrative offices, and associated storage and maintenance facilities
- *Stevens Canyon:* entrance station
- *Other campgrounds:* campsites at the Sunshine Point, White River, Ipsut Creek, Cougar Rock, Sunrise, and Mowich Lake areas
- *Tahoma Woods:* park headquarters, employee residences, greenhouse, wastewater treatment plant, horse barn, and storage area

**Natural Zone** — This zone covers about 6,708 acres and includes two nonwilderness areas near the Nisqually entrance, the Paradise Meadows, the Sunrise meadows and campground area, and an area north of Carbon River Road.

**Special-use Zone** — The special use zone includes several structures and small areas in the park, covering about 10 acres. The Nisqually River and Silver Springs dikes, the snow play area, a telephone cable corridor, and radio antennas are included in this zone.

**Wilderness Zones.** Application of the wilderness zones includes the following.

**Trail Zone** — This zone currently applies to 55,811 acres of the park and includes areas of lower forest, subalpine, and some alpine environments. Within this zone are all but two of the well-developed and maintained type A and B trails, trailside camps, and areas within 0.25 mile of the trails or trailside camps. Where trailside camps are on lakes, the trail zone includes an area of 0.25 mile around the lakes. A total of 38 trailside camps with 143 individual campsites and 23 group sites have been established within the trail zone.

**Cross-country Zone** — The cross-country zone includes 124,739 acres of the park and covers lands and waters located a minimum of 0.25 mile from the trail zone and from roads. The zone currently extends from lower forest areas to subalpine environments up to treeline (generally 6,000–6,800 feet elevation). The 2,540-acre Butter Creek Research Natural Area (the area within the park) is included within this zone, but it is managed differently than the rest of the zone in that no recreational use is permitted in this area.

**Alpine Zone** — Areas in the alpine zone provide challenging climbing and alpine hiking opportunities. This 47,930-acre zone includes the area above treeline and primarily contains exposed rock, glaciers, and snowfields. The opportunity to experience solitude during the summer months ranges from high on the more remote or technically difficult climbing routes to extremely low on popular routes.

**National Historic Landmark District.** The district covers 1,716 acres, which overlie other

nonwilderness and wilderness zones. It includes the park road system and most of the major developed areas. Most of the Longmire, Paradise, and Sunrise areas are in this zone. Some wilderness structures (e.g., ranger cabins and lookouts along the Wonderland Trail) also are included in this district, so they are included in both the historic zone and a wilderness subzone.

## PARKWIDE ACTIONS

### Resource and Visitor Management

Under this alternative, Mount Rainier National Park would continue to be managed as it has in the past, relying on the “Statement for Management” (NPS 1988b), the *Wilderness Management Plan* (NPS 1992c), and other approved plans. The park staff would continue to respond to issues a case by case, and major changes in management direction would not occur; that is, current management practices would continue. No major new initiatives would be pursued to manage visitors in the nonwilderness and wilderness areas, and a parkwide visitor carrying capacity strategy would not be established.

### Interpretation, Education, Information, and Orientation

Opportunities for interpretation, information, and orientation would continue to be available at existing facilities both inside and outside the park. The exhibits and media at the Paradise, Ohanapecosh, and Sunrise visitor centers, the Longmire museum, and the White River, Wilkeson, Longmire, and Paradise wilderness information ranger stations would be rehabilitated in accordance with the “Long-Range Interpretive Plan” (NPS 2000a). The National Park Service would continue to work with partners to provide information to visitors at locations outside the park, including the visitor contact stations at Silver Creek, Enumclaw, and Packwood, and the Outdoor Recre-

ation Information Center in Seattle. The park wilderness information centers would remain in their current locations.

The Henry M. Jackson Memorial Visitor Center, which was built at Paradise in the mid-1960s, has more than 500,000 visitors per year. The 60,000-square-foot structure is at an elevation of 5,400 feet and is subject to extreme weather conditions, including high snow accumulation, cold temperatures, high winds, and an extended winter season. In addition to visitor services (information desk, restrooms, auditorium, exhibit space, bookstore, observation area, gift shop, and food services), the facility provides seasonal ranger and concessioner quarters, interpretive and ranger staff offices, maintenance workrooms, heating, ventilation, air conditioning space, and backup electrical generation for the Paradise area. Under this alternative current uses would remain, and interior spaces would not be rehabilitated.

### **Wilderness Management and Use**

**Day and Overnight Use.** Designated wilderness in Mount Rainier would continue to be managed according to the *Wilderness Management Plan* (NPS 1992c). The zones and established standards in that plan would continue to be followed. The limits of acceptable change monitoring would continue. Day use in wilderness would continue to be unregulated.

**Wilderness Trailheads.** Wilderness trailheads are not in wilderness but are described here because they are where people begin their wilderness experiences. At all times parking at wilderness trailheads would continue to take place on a first-come, first-served basis. Overflow parking would continue to occur at wilderness trailheads.

### **Winter Use**

**Skiing, Snowshoeing, and Snowboarding.** These activities would continue to be allowed throughout the park.

**Overnight Camping.** Drive-in camping at the Sunshine Point and Ipsut Creek campgrounds would continue to be available in the winter. Snow camping would continue to be allowed at existing locations in Paradise when there is 5 feet of snow cover. Walk-in or ski-in camping would continue to be allowed at Ohanape-cosh. In other areas a minimum of 2 feet of snow cover for camping would be encouraged. Permits would continue to be required for overnight camping in the wilderness area.

### **Trails System**

The existing trails system would be maintained according to current practices, and there would be no new management initiatives. Management issues would be addressed as time and funds allow.

### **Geologic Hazards**

The National Park Service would continue its current efforts to alert visitors to potential geologic hazards (e.g., debris flows, volcanic eruptions, glacial outburst floods) in the park. Notices about the threat of geologic hazards would continue to be included in the park newsletter and Web site, as well as park exhibits. Signs would be maintained in high hazard areas, such as the White River and Cougar Rock campgrounds.

### **Air Quality**

The park staff would continue to work with its partners to maintain and improve the air quality of the park and region. However, no new efforts would be initiated to minimize the effects of in-park pollution sources on air quality.

### **Preserving Natural Soundscapes**

The park staff would continue to enforce existing noise policies in the wilderness area. However, no new efforts would be initiated to minimize the effects of aircraft overflights or land-based noise sources on natural quiet in the wilderness area.

### **Management of Pack Stock**

Pack stock would continue to be permitted on designated trails and roads.

### **Management of Tour Buses**

No new efforts to manage tour buses would be initiated.

## **ACTIONS BY GEOGRAPHIC AREA — SUMMER**

Under the no-action alternative (continue current management), existing management policies would be continued and no new initiatives would be implemented.

### **Westside Road**

Private vehicles would continue to be allowed to drive on Westside Road up to the road closure at the Dry Creek parking area from Memorial Day until snow closes the road. Beyond this point only park administrative vehicles would be allowed. The road would be permanently maintained for vehicular use up to the Dry Creek parking area. Other activities would include bicycling, hiking, and pack stock use. No other means of access (such as shuttles) would be provided, and no additional parking or visitor facilities would be constructed.

### **Longmire**

No major new visitor use management efforts would be made at Longmire. Existing parking

facilities would be maintained and overflow parking would continue to be allowed. The former campground would continue to be used only by park volunteers. Other visitor and administrative facilities would be maintained, and no major new facilities would be constructed.

### **Ricksecker Point**

The land inside the road loop would continue to be largely undeveloped and there would be no new visitor facilities.

### **Paradise**

No additional efforts would be made to manage visitor use at Paradise.

- *Visitor access:* Private vehicles would continue to drive to Paradise year-round, with parking on a first-come, first-served basis. The only limits on the number of vehicles permitted at Paradise would be the number of parking spaces. No shuttles would be provided for visitors except for climbing concession guests, most of whom would continue to use a shuttle. The voluntary employee shuttle would also continue.
- *Traffic flow circulation:* Visitors would continue to travel to Paradise along the two-way road to the Paradise parking lots. Visitors would then exit Paradise by driving east past the Paradise Inn along the one-way Paradise Valley Road or by returning on the two-way road.
- *Parking:* There would continue to be 750 designated parking spaces, with parking spaces for tour buses. Overflow parking would continue to be allowed, which would provide additional parking spaces (500+ cars). A historic turnaround, a parking area accessible to visitors with disabilities, and a holding area for private shuttles would remain adjacent to the Paradise Inn.

- *Henry M. Jackson Memorial Visitor Center:* The visitor center would continue to be used and maintained, but would not be rehabilitated.

### **Ohanapecosh**

Visitor and administrative facilities at Ohanapecosh area would continue to be maintained, and the existing day-use and visitor center parking areas would remain in their current configuration.

### **White River**

No major new visitor use management initiatives would occur in the White River area. Visitors would continue to drive to this area on a first-come, first-served basis. All visitor facilities at the campground would be retained.

### **Sunrise**

Sunrise would be managed as it has been in the past. No major new visitor use management initiatives would occur.

- *Visitor access:* Visitors could continue to drive to Sunrise, with parking on a first-come, first-served basis. No shuttles would be provided, and there would be no limits on the number of vehicles permitted at Sunrise (except as limited by the number of parking spaces).
- *Parking:* Designated parking spaces would continue to be provided for 260 private vehicles, with overflow parking for up to 340 vehicles. Parking spaces would continue to be provided for tour buses.
- *Visitor and administrative facilities:* With the exception of Sunrise Lodge, all the existing facilities at Sunrise would be retained. The Sunrise Lodge would be replaced with a ranger/concession facility. The developed picnic area north of the

Sunrise “stockade complex” would be maintained at its current size. No new picnic sites would be added.

### **Mowich**

No major new visitor use management initiatives would occur in the Mowich area.

- *Visitor access:* The gravel road from the park boundary to Mowich Lake would remain open and would continue to be maintained for private vehicle use. The turnaround point would remain at the end of the road near the camping area, which lies within the lake’s watershed. The number of vehicles on the road would not be limited.
- *Parking:* No changes would occur to the existing parking area. The existing 50 designated parking spaces would be retained. Overflow parking along the roadway would continue to be allowed. No new initiatives would be occur to manage these parking spaces.
- *Visitor facilities:* Walk-in camping would continue to be permitted in a large circular disturbed area at the end of the road that was formerly used as a parking lot. This area would not have designated campsites. Picnic sites in the Mowich area and at Paul Peak would be retained.

### **Carbon River**

No major new visitor use management initiatives would occur at Carbon River.

- *Visitor access:* The road to Ipsut Creek would be repaired and maintained (including repair of future washouts). Visitors could drive their private vehicles to Ipsut Creek. No shuttles would be provided. Hiking and bicycling along the road would continue to be allowed, along with the use of pack stock.

- *Parking:* No changes would be made to parking spaces, and overflow parking would continue to be permitted along the road.
- *Visitor and administrative facilities:* The existing administrative facilities at the Carbon River entrance would be retained. The campground at Ipsut Creek would be maintained in its current use for drive-in camping. The existing picnic sites at Ipsut Creek campground and along Carbon River Road would also remain.

## **ACTIONS BY GEOGRAPHIC AREA — WINTER**

As for summer actions under the no-action alternative (continue current management), existing management policies would be continued and no new initiatives would be implemented.

### **Westside Road**

Westside Road would not be plowed. Visitors could continue to drive up to the existing road closure near the junction with the Nisqually to Paradise road. Skiing and snowshoeing would still be permitted.

### **Longmire**

There would be no change in management actions or facilities at Longmire.

### **Ricksecker Point**

The area would remain closed to vehicular access. Skiing and snowshoeing would still be permitted.

### **Paradise**

The road from Nisqually to Paradise would continue to be plowed, and visitors would be allowed to drive to Paradise when weather conditions permit. The groomed snow play

area (with a parking area and restrooms) would continue to be maintained, and snow play would continue to be allowed only in the designated area (provided that there is 5 feet of snow cover). Staffing of the snow play area would continue to be provided on weekends and holidays.

### **Ohanapecosh**

The state would continue to plow State Route 123 up to Ohanapecosh, and existing winter parking facilities would be maintained. Skiing, snowshoeing, and snowboarding, and winter camping would still be allowed.

### **Northeast Area**

Existing management policies would be continued, and no major new initiatives would be implemented. As is now the practice during the winter, State Route 410 would not be plowed, and the northeast portion of the park would remain closed to private vehicles. The existing sno-park at the park boundary would be maintained, and skiing, snowboarding, and snowshoeing would be allowed on the road to the campground, as well as beyond the Mather wye (State Route 410). No visitor facilities would be available, and there would be no major new initiatives to manage visitors at these locations.

### **Mowich**

As is the current practice, the road to Mowich Lake would not be plowed, and private vehicles would continue to be allowed on the unpaved road only up to the gate at the Paul Peak trailhead, just inside the park boundary. Skiing and snowshoeing would continue to be allowed.

### **Carbon River**

Carbon River Road would remain open for private vehicles to the Ipsut Creek campground, except during temporary closures

caused by unusual snowfall, downed trees, or washouts, but the road would not be plowed. Skiing and snowshoeing would be allowed, but typically this area has insufficient snowfall for these activities.

### **COSTS AND IMPLEMENTATION**

Management actions described under the no-action alternative (continue current management) would continue to be implemented over the next 20 years as funding became available. Priorities for implementation would remain as identified in existing approved documents, such as the park's "Strategic Plan (NPS 2000b)

and *Resource Management Plan* (NPS 1999e). Because this alternative would not involve any new management initiatives or new capital expenditures, there would be no initial costs associated with its implementation.

There would be no additional park employment under the no-action alternative (continue current management). The costs of ongoing park operations and maintenance would continue at essentially current levels. Information about the park's operations and maintenance budgets are on file at park headquarters.

## ALTERNATIVE 2: PREFERRED ALTERNATIVE

The National Park Service's preferred alternative would enhance both visitor use opportunities and the protection of natural and cultural resources, compared to the no-action alternative (continue current management). This would be accomplished by modifying management practices to improve existing conditions and address changes that are anticipated in the next 20 years.

The primary goals of the preferred alternative would be to better manage peak-period visitation so that it did not adversely affect visitor experiences and park resources and to encourage more off-peak use of the park. Key elements of the preferred alternative include the following:

- Establish a visitor carrying capacity framework and use it to ensure the preservation of park resources and the quality of the visitor experience.
- Establish shuttle services while also eliminating parking, which would reduce traffic congestion and ensure effective visitor transportation within the park.
- Provide additional opportunities for visitors to use the park in the summer and winter.
- Replace the Henry M. Jackson Memorial Visitor Center at Paradise with a smaller, more efficient visitor center.
- Improve the visitor information program internally and externally.
- Enhance the protection of resources, including air quality and natural soundscapes.

Unless otherwise stated in the "Direction for the Plan" section, all existing park facilities would continue to be maintained and existing recreational uses would continue to be permitted. Past decisions regarding facilities, such as constructing a new ranger station/concession facility at Sunrise, also would be implemented.

### PROPOSED ZONING

#### Zone Definitions

Through the general management planning process, a new set of prescriptive management zones was developed for the park. The new prescriptive zones would manage different areas of the park to achieve different physical, biological, and social conditions. As shown in table 1, each zone is defined in terms of desired resource conditions, desired visitor experiences, and facilities and activities. The zones also provide a framework for managing overnight use *and* day use levels, unlike the zones currently used. A complete description of the zones is provided in appendix C.

As with the no-action alternative (continue current management), the Mount Rainier National Historic Landmark District would continue to overlie the prescriptive management zones. Most of the district would be within nonwilderness zones, but the Wonderland and Northern Loop trails and some structures in the wilderness zones would also be within the National Historic Landmark District.

TABLE 1: MANAGEMENT ZONE DEFINITIONS

Management Zone	Desired Resource Condition	Desired Visitor Experience	Facilities and Activities
<b>Wilderness Zones — In all zones, activities would be consistent with the wilderness designation. Unmaintained, constructed trails might still be present and still be used in all of these zones.</b>			
Research natural area	Would provide a baseline for ecological study, with no visible signs of human use.	None. Access would be for approved research and educational purposes only.	Research and educational purposes only.
Pristine	Essentially untouched environment that is modified only by existing cultural resources.	The feeling of being alone.	Very minimal signs of human use, no trails or designated campsites of any kind.
Primitive	Largely natural, unmodified landscape.	Opportunities to experience solitude and quiet. Visitors would feel apart from other people, but not entirely alone.	Minimal signs of human use, except for a few primitive routes and designated campsites in alpine areas.
High-use climbing	Natural landscape modified by the presence of wilderness-appropriate structures. No visible signs of human use off the routes.	A moderate to high degree of social interaction and few opportunities for solitude.	A few wilderness-appropriate structures such as primitive routes and designated campsites. Activities oriented toward mountaineering.
Moderate-use climbing	Similar to the high-use climbing zone.	Moderate to low degree of social interaction and more opportunities for solitude.	Similar to the high-use climbing zone.
Semi-primitive trail	Natural landscape modified by the presence of wilderness-appropriate structures.	Wilderness experience with occasional periods of solitude.	Designated trails, camps, and other wilderness-appropriate structures. Activities oriented toward hiking.
Transition trail	Natural landscape modified by the presence of wilderness-appropriate structures.	Wilderness hiking experience with a high degree of social interaction and few opportunities for solitude.	Same as the semiprimitive zone, but with greater evidence of human use.
<b>Nonwilderness Zones</b>			
Primitive	Maintained in a natural state, similar to wilderness primitive zone, except trails may be provided.	Similar to the wilderness primitive zone.	Similar to the wilderness primitive zone. However, overnight camping would not be permitted.
Sensitive resource / recreation	Natural landscape, with no human use visible outside designated trails and use areas.	Experience of park resources generally unimpeded by other visitors and relatively close to developed facilities. A high degree of social interaction.	Facilities and structures in localized areas. Hiking would be the primary activity.
Roaded multiuse	Natural landscape modified by developed facilities.	High degree of social interaction; motorized vehicles limited to public shuttles, visitors with disabilities, and park administration.	Gravel roads, trails, walk-in campgrounds and picnic areas, small buildings. Activities would include hiking and bicycling.
Visitor facilities	High modification to natural processes and the natural landscape.	Highly structured opportunities to enjoy and learn about park; access by foot, bicycle, and motor vehicle; high degree of social interaction.	A wide array of visitor services and facilities, including roads, entrance stations, visitor centers, lodges, and campgrounds; activities would include bicycling, hiking, snow play, scenic driving, skiing, and camping.

**TABLE 1: MANAGEMENT ZONE DEFINITIONS (continued)**

<b>Management Zone</b>	<b>Desired Resource Condition</b>	<b>Desired Visitor Experience</b>	<b>Facilities and Activities</b>
Administrative	High modification to natural processes and the natural landscape.	General visitation would not occur, although some visitors might access these areas to obtain staff assistance or learn about historically significant buildings.	Concentrations of administrative facilities to support park management and operation. Activities would be associated with park administration.

After defining the desired resource conditions and visitor experiences in terms of management zones, the National Park Service applied them to Mount Rainier National Park. The results are shown in the maps entitled Summer Management Zones and Winter Management Zones.

**Summary of Wilderness Management Zones**

Seven management zones would be applied to the wilderness to allow for a variety of trail and off-trail experiences. The zones would be the same in the summer and winter, although in the winter the wilderness would be less accessible to visitors because of snow.

- Areas without maintained trails would primarily fall into either the pristine or the primitive zones. Most of the lower forest and glaciers would be classified as pristine, and most of the subalpine region would be in the primitive category.
- The Butter Creek Research Natural Area would be a separate zone. Access to this area would be limited to approved research and educational purposes.
- The major climbing routes would be within either the moderate-use or the high-use climbing zones.
- Most trail corridors and associated designated campsites, including much of the Wonderland Trail, would be classified as semiprimitive trail.

- A few of the more popular trails, including trails to Spray Park, Comet Falls, and Burroughs Mountain, would be categorized as transition trail.

**Summary of Nonwilderness Management Zones**

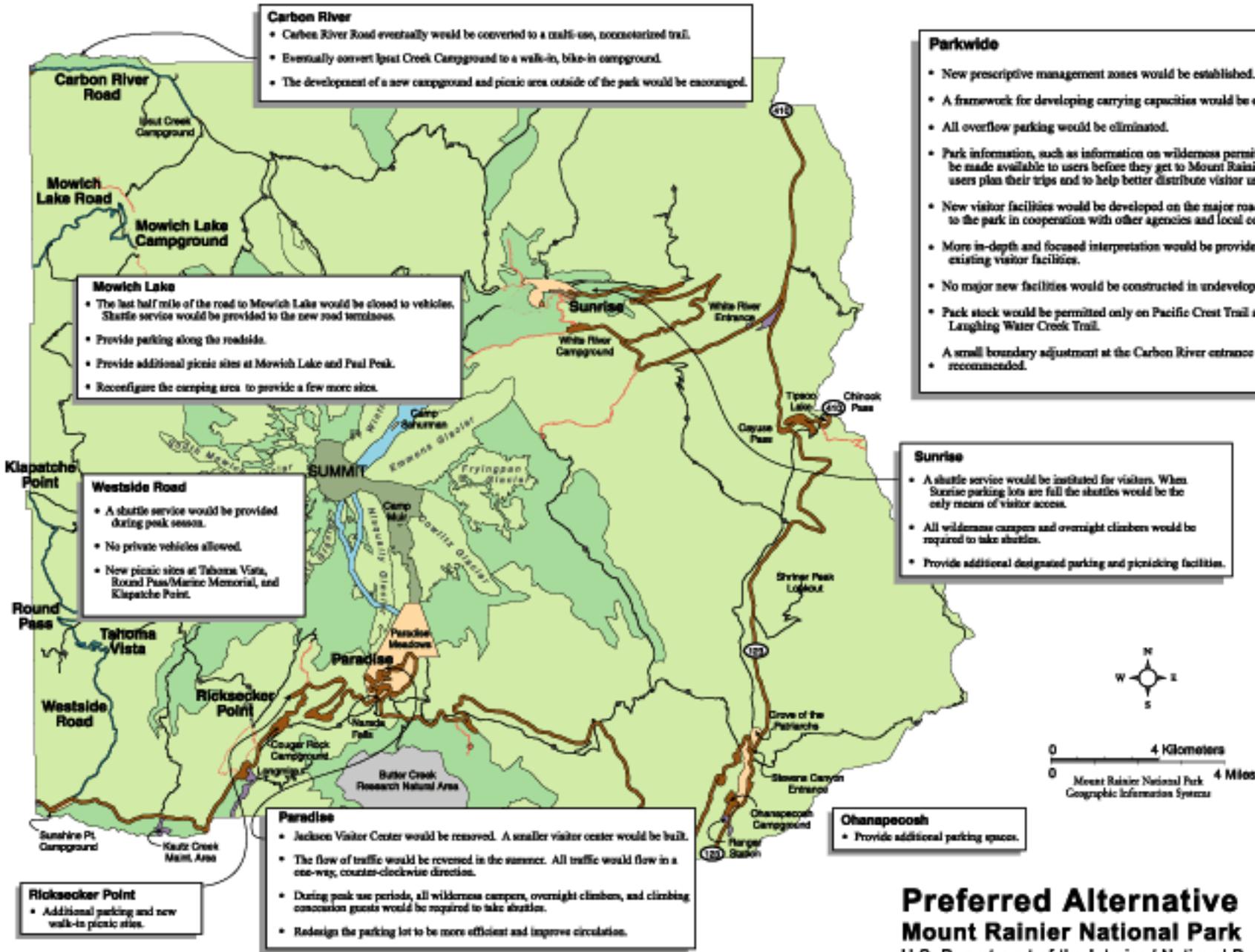
Management zones for the nonwilderness areas of the park are summarized in table 2. In some areas, different management zones would be applied seasonally to accommodate the major differences in types of use and resource protection that are associated with winter snow cover. The application of summer zones usually would begin between the end of May and July, depending on the area, and would end when the roads could not be kept clear using push plows. This situation usually occurs between late September and mid-October.

Generally, the visitor experience of the management prescription would become more primitive in winter, when facilities such as roads, restrooms, and picnic tables are covered by snow. Resource management concerns change seasonally as soils and vegetation are protected by snow.

**PARKWIDE ACTIONS**

**Visitor Experience and Resource Protection (Carrying Capacity)**

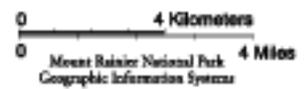
Under the preferred alternative, a visitor experience and resource protection framework would be established for Mount Rainier, as illustrated on the Carrying Capacity Framework figure. This approach to addressing



- Parkwide**
- New prescriptive management zones would be established.
  - A framework for developing carrying capacities would be established.
  - All overflow parking would be eliminated.
  - Park information, such as information on wilderness permits, would be made available to users before they get to Mount Rainier to help users plan their trips and to help better distribute visitor use.
  - New visitor facilities would be developed on the major roads leading to the park in cooperation with other agencies and local communities.
  - More in-depth and focused interpretation would be provided at existing visitor facilities.
  - No major new facilities would be constructed in undeveloped areas.
  - Pack stock would be permitted only on Pacific Crest Trail and Laughing Water Creek Trail.
  - A small boundary adjustment at the Carbon River entrance would be recommended.

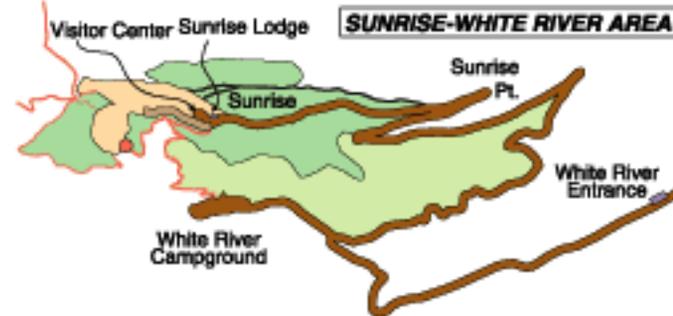
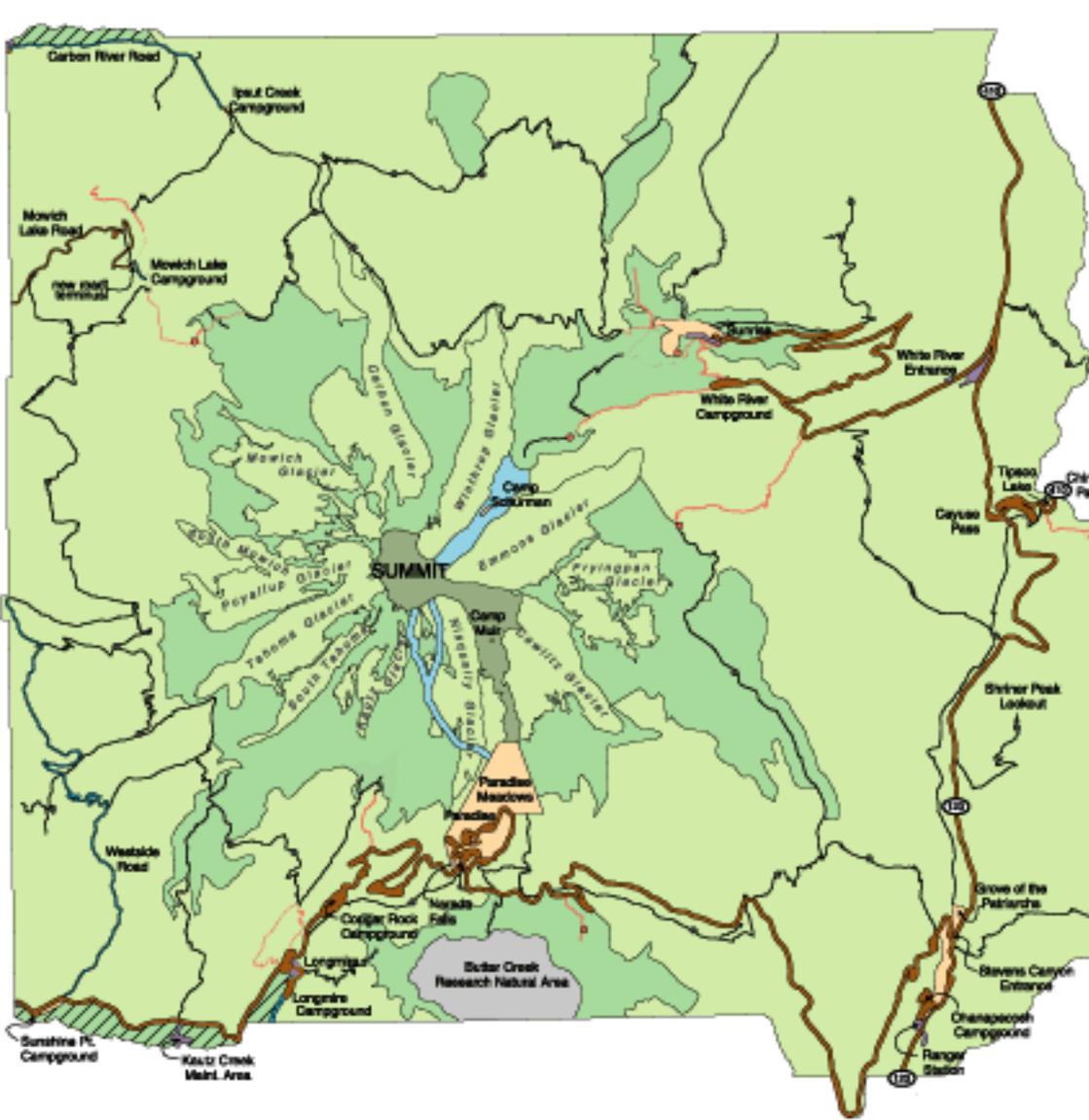
- Sunrise**
- A shuttle service would be initiated for visitors. When Sunrise parking lots are full the shuttles would be the only means of visitor access.
  - All wilderness campers and overnight climbers would be required to take shuttles.
  - Provide additional designated parking and picnicking facilities.

- Ohanapecosh**
- Provide additional parking spaces.

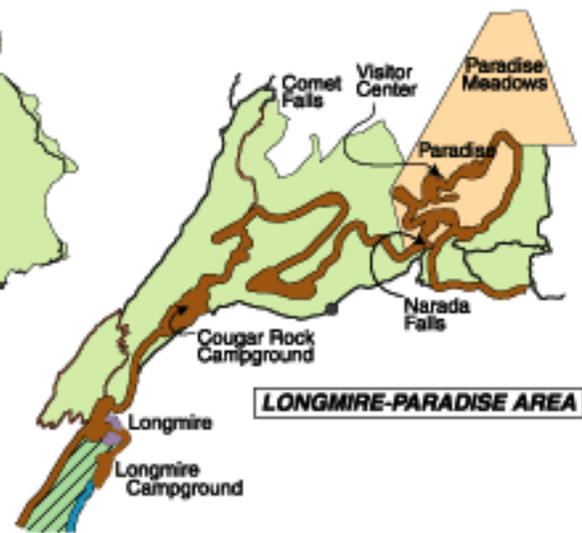


**Preferred Alternative**  
**Mount Rainier National Park**  
 U.S. Department of the Interior / National Park Service  
 DSC / JULY 2001 / 105 / 20,134B

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- | WILDERNESS ZONES      | NON WILDERNESS ZONES           |
|-----------------------|--------------------------------|
| Pristine              | Administrative                 |
| Primitive             | Visitor Facilities             |
| Research Natural Area | Sensitive Resource/Restoration |
| Transition Trail      | Roaded Multiple                |
| Semi-Primitive Trail  | Primitive                      |
| High Use Climbing     |                                |
| Moderate Use Climbing |                                |

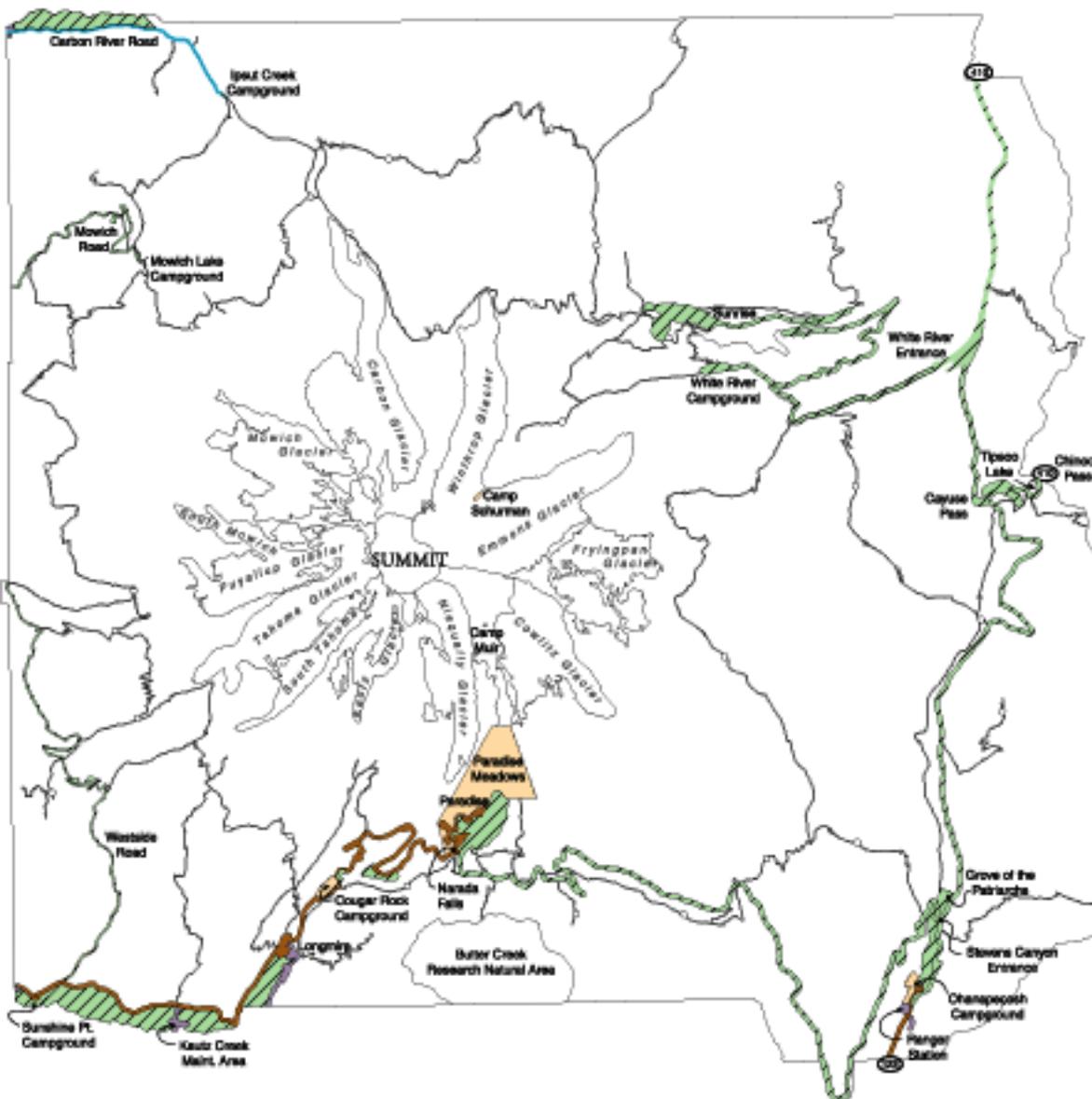


0 4 Kilometers  
 0 4 Miles  
 Mount Rainier National Park  
 Geographic Information Systems  
 SCALE FOR PARK MAP ONLY

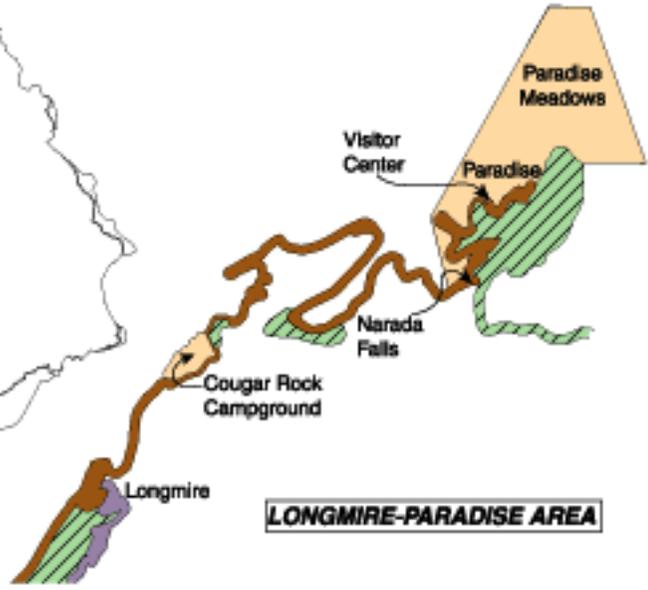
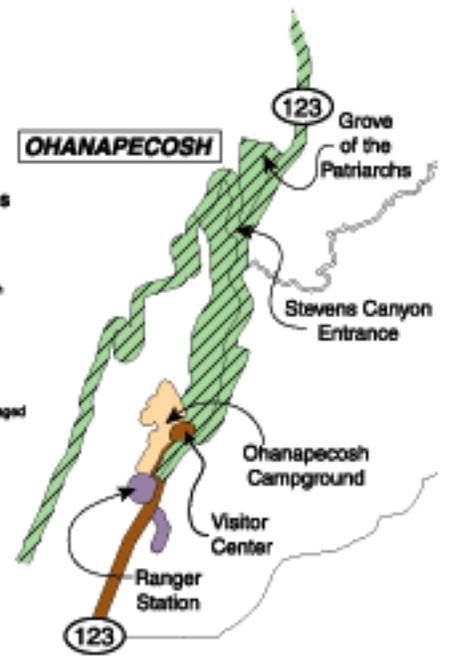


**Summer Management Zones**  
**Mount Rainier National Park**  
 U.S. Department of the Interior / National Park Service  
 DSC / AUGUST 2000 / 105 / 20,132

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- NONWILDERNESS ZONES**
- Administrative
  - Visitor Facilities
  - Sensitive Resource/ Recreation
  - Roaded Mullins
  - Primitive
- WILDERNESS ZONES**
- wilderness zones managed same as in summer



0 4 Kilometers  
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Mount Rainier National Park  
Geographic Information Systems  
SCALE FOR PARK MAP ONLY



**Winter Management Zones**  
**Mount Rainier National Park**  
 U.S. Department of the Interior / National Park Service  
 DSC / AUGUST 2000 / 105 / 20,133

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TABLE 2: NONWILDERNESS MANAGEMENT ZONES FOR THE PREFERRED ALTERNATIVE

Location	Management Zone	
	Summer	Winter
Southern Part of Park		
Area south of the Nisqually to Paradise Road	Primitive	Primitive
Kautz Creek maintenance area	Administrative	Administrative
Area south of Longmire	Primitive	Primitive
Grove of the Patriarchs	Sensitive resource / recreation	Primitive
Paradise Meadows	Sensitive resource / recreation	Sensitive resource / recreation
Ohanapecoh trails area	Sensitive resource / recreation	Primitive
Camp Muir	Sensitive resource / recreation	Sensitive resource / recreation
Ricksecker Point	Visitor facilities	Primitive
Westside Road	Roaded multiuse	Primitive
Cougar Rock campground and picnic area	Visitor facilities	Sensitive resource / recreation
Paradise picnic area	Visitor facilities	Primitive
State Route 123 north from Ohanapecoh to the Stevens Canyon entrance	Visitor facilities	Primitive
Tahoma Woods	Visitor facilities and administrative	Visitor facilities and administrative
Nisqually entrance	Visitor facilities and administrative	Visitor facilities and administrative
Road from the Nisqually entrance to the upper Paradise parking area	Visitor facilities	Visitor facilities
Paradise Valley Road, including parking areas	Visitor facilities	Primitive
Sunshine Point campground	Visitor facilities	Visitor facilities
Part of Paradise developed area, including visitor center, inn, and picnic area	Visitor facilities	Visitor facilities
Part of Paradise developed area, including NPS and concession offices, employee dormitories, and the Guide House	Administrative	Administrative
Part of Longmire area, including the wilderness information center/museum, inn, and Trail of the Shadows	Visitor facilities	Visitor facilities
Part of Longmire area, including maintenance area, offices, employee housing, community building	Administrative	Administrative
Skate Creek access road	Roaded multiuse	Administrative
Historic Longmire campground	Visitor facilities	Administrative
Ohanapecoh visitor center, campground, picnic area, and associated parking areas	Visitor facilities	Sensitive resource / recreation
Ohanapecoh ranger station, maintenance, and employee housing area	Administrative	Administrative
State Route 123 from the junction with State Route 410 south to Ohanapecoh	Visitor facilities	Primitive
State Route 123 from Ohanapecoh south to the park boundary	Visitor facilities	Visitor facilities
Stevens Canyon Road	Visitor facilities	Primitive
Northeast Part of Park		
White River campground	Visitor facilities	Primitive
Trail areas at Sunrise	Sensitive resource / recreation	Primitive
State Route 410 from its intersection with the Sunrise Road (Mather wye) to the east park boundary at Chinook Pass	Visitor facilities	Primitive

**TABLE 2: NONWILDERNESS MANAGEMENT ZONES FOR THE PREFERRED ALTERNATIVE (Continued)**

Location	Management Zone	
	Summer	Winter
Camp Schurman	Sensitive resource / recreation	Sensitive resource / recreation
White River entrance area	Administrative	Primitive
Roads from the White River entrance to the White River campground and to Sunrise, including the parking area	Visitor facilities	Primitive
Sunrise visitor center, ranger station/concession facility, picnic area, and walk-in campground	Visitor facilities	Primitive
Tipsoo Lake parking and picnic area	Visitor facilities	Primitive
Park operations areas at White River and Sunrise, including employee housing and maintenance areas	Administrative	Primitive
Northwest Part of Park		
Area north of Carbon River Road	Primitive	Primitive
Carbon River Road	Roaded multiuse	Roaded multiuse
Ipsut Creek campground	Roaded multiuse	Roaded multiuse
Mowich Lake Road up to its new terminus about 0.5 mile before the lake	Visitor facilities	Primitive
Mowich Lake Road from its new terminus to the lake	Roaded multiuse	Primitive
Mowich Lake campground	Visitor facilities	Primitive

carrying capacity is similar to the wilderness limits of acceptable change (LAC) process that has been used to monitor and manage the Mount Rainier Wilderness since 1989.

At the top of the framework, guiding all actions, is a vision of resource and ecological integrity, visitor use, and visitor experience for Mount Rainier. This vision is to ensure that all natural processes and functions are operating with minimal changes due to visitors, and that visitors have high-quality experiences.

Inventorizing the park’s resources and visitor uses constitutes the next level of the framework. Ecological systems play a major role in determining the type and level of visitor use that can be accommodated in different parts of the park.

The next step involves defining prescriptive management zones, which were summarized in table 1, and allocating them to specific park locations (table 2). For each zone, indicators and standards are selected. Indicators are specific, measurable variables that can be

monitored to determine the quality of natural and cultural resource conditions and visitor experiences. Standards identify the minimum acceptable conditions for each resource or social indicator and warn when management actions are merited.

The indicators are systematically monitored in the zones to determine the conditions of resources and visitor experiences. Effective monitoring of resource and social indicators provides the documentation needed to implement meaningful management action. Monitoring documents if and when a management action is needed to keep conditions within the standards.

The final level is management action. Management actions would be taken if resource conditions or visitor experiences were out of standard or monitoring indicated a downward trend in the condition of the resources or visitor experiences. The intent of the management actions would be to improve the situation and achieve the intended conditions within the zone. Management actions would range from low intrusiveness (such as education and

signing) to highly restrictive (such as closures or use limits).

Concurrent with such physical environmental changes is visitors' perception (often not consciously recognized) that an area's aesthetic quality has been degraded.

**Interim Carrying Capacities.** The preferred alternative lays the framework for carrying capacity and does not set limits. Until visitor experience and resource indicators and standards were applied in the zones, physical carrying capacities would serve as the interim carrying capacities for the nonwilderness portion of the park. Physical carrying capacities would be determined by how many vehicles a specific parking lot could hold without overflow onto the roads and the capacity of shuttles. In the Mount Rainier Wilderness the limits of acceptable change monitoring would continue to be conducted, and the limits of acceptable change standards, identified in the *Wilderness Management Plan* (1992c), would continue to serve as the interim carrying capacities for the wilderness.

**Indicators and Standards.** In the next five years the park staff would apply resource and visitor indicators and standards in the zones. Preliminary resource indicators have been identified for all of the wilderness zones and for the sensitive resource/recreation zone in the nonwilderness portion of the park. These resource indicators, which are described in appendix D, include visual condition classes, and aquatic, wildlife, soundscape, and night sky indicators. However, the standards for the resource indicators are still in development and are not ready to be applied.

**Monitoring.** The park staff would institute a monitoring program in selected sites in the nonwilderness and in wilderness to determine if resource and social conditions were improving or deteriorating. If they were deteriorating, the monitoring results would alert managers as to whether or not conditions

had degraded to an unacceptable level (i.e., violated standards).

Mount Rainier National Park would carry out different levels of monitoring. In areas where resource degradation was occurring or visitors were affecting unique or sensitive areas, the monitoring would be intensive. Other areas might be monitored on a tiered approach: Immediate and annual monitoring might be done on those areas that were close to or out of standard (tier 1). Areas that might be approaching a standard or have other emerging needs (but not as pressing as the first tier) might be monitored every two or three years. A third tier of areas that appeared to be in good shape and were not experiencing rapid change might be monitored on a less frequent schedule, perhaps every five years.

**Management Actions.** If it became necessary to take action because standards were being approached or violated, the least intrusive or restrictive method to ensure resource protection and quality visitor experiences would first be used. Then successive management actions would be applied until conditions were not violating the standards. Techniques that might be used in this regard include the following:

- ongoing visitor education (e.g., providing information through different media regarding the sensitivity of resources, the impacts visitors cause, the rationale for permits, and outdoor ethics, encouraging people to go to other less crowded or less sensitive areas).
- site management (e.g., providing more defined, well-marked trails, revegetating areas, installing vegetative barriers, closing areas/facilities such as trails or campsites, rerouting trails)
- deterrence and enforcement actions (e.g., posting signs, conducting volunteer or

ranger patrols, enforcing sanctions or fines for violations)

- rationing and allocation (e.g., requiring permits for day-use visitors, reservations, queuing, lotteries, charging fees for the use of wilderness trails or trailhead parking areas)
- regulating use (e.g., limiting the number of people, the location, or time of visits; limiting activities; requiring guides for hikes).

If it became necessary to set use limits in the future, the potential effects of the action on visitors and resources would be first carefully analyzed, and opportunities would be provided for public involvement in this decision.

**Tasks for Establishing the Visitor Experience and Resource Protection Framework.** Tasks required to establish the visitor experience and resource protection framework at Mount Rainier National Park would include the following:

- setting resource and social indicators and standards
- identifying, defining, and testing those indicators and standards
- determining how and where to monitor the indicators
- determining which management actions would be appropriate in various situations

Dynamic simulation models could be developed both for specific sites and parkwide to analyze what would happen if different carrying capacities or management actions were implemented. As necessary, additional environmental analyses would be prepared, as required under the National Environmental Policy Act.

The visitor experience and resource protection framework initially would be applied in several high priority areas that receive (or are expected to receive) high use levels and/or have suffered resource and visitor experience impacts. These areas include Paradise, Sunrise, Carbon River/Mowich Lake, Chinook Pass/Tipsoo Lake, and the area adjacent to the Crystal Mountain ski area. Indicators and standards would be developed for these areas, and monitoring programs initiated, as soon as possible. Management actions would be taken to address visitor impacts occurring (or expected to occur) in these areas.

### **Interpretation, Education, Information, and Orientation**

The preferred alternative would include improved opportunities for interpretation, education, information, and orientation. The revised information services program would employ resources both within and outside of the park.

**Inside the Park.** Existing visitor centers and museums would be used to provide more in-depth and focused interpretation, highlighting topics relevant to the nearby setting. For example, cultural history and river ecology could be emphasized at Longmire, information on volcanoes and geology might be presented at Sunrise, and interpretation at Paradise might focus on subalpine and alpine ecology.

In accordance with the “Long-Range Interpretive Plan,” a major rehabilitation or replacement of the audiovisual programs and exhibits would occur in visitor centers and ranger stations within the park. Limited interpretation (e.g., brochures, tapes, radio transmissions) would be provided on shuttles serving visitors.

# Carrying Capacity Framework

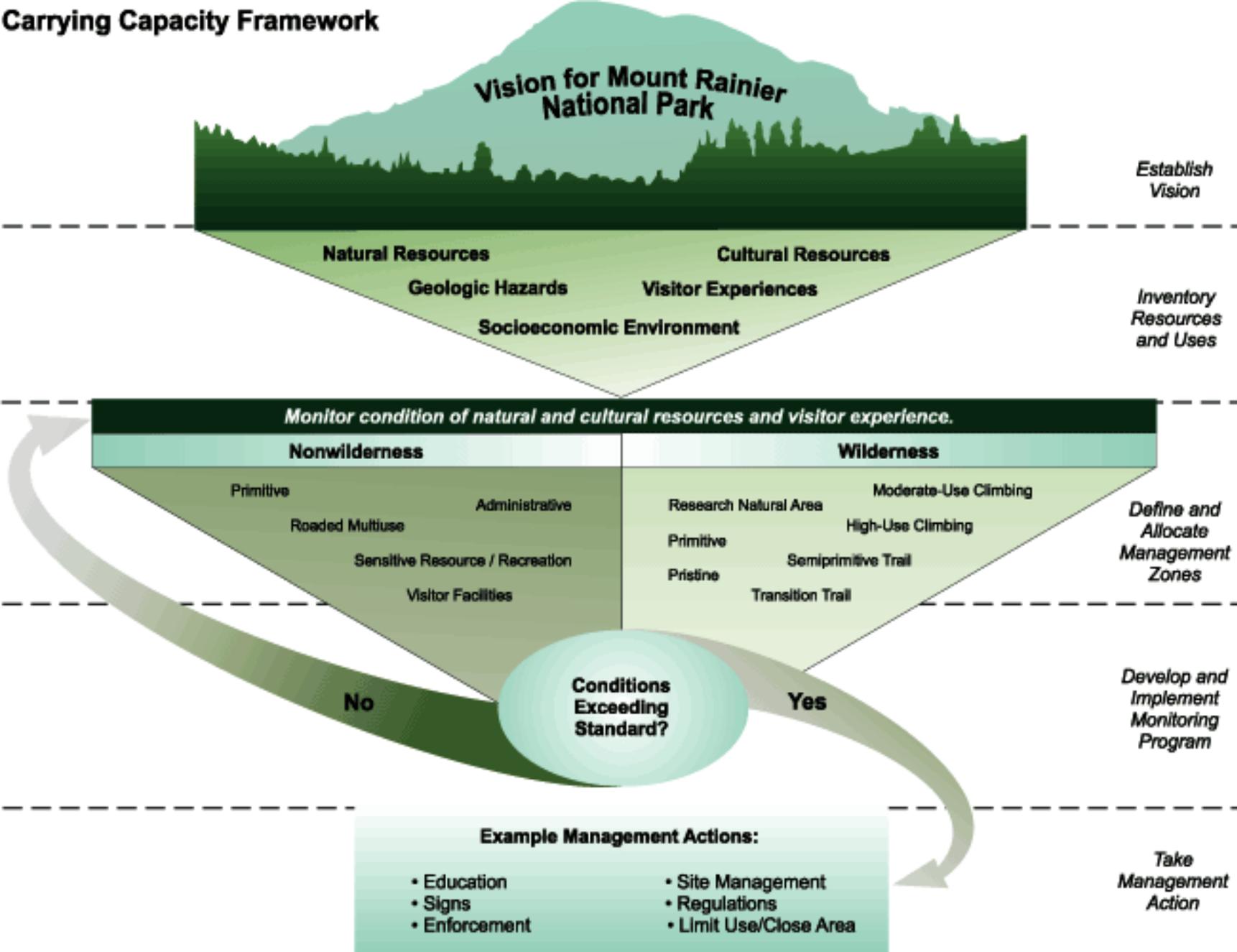


Figure 1

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**Outside the Park.** During the summer season, several new staffed visitor welcome centers would be operated outside of the park. These summer facilities would be located along the major roads leading into the park, potentially including State Routes 410, 165, and U.S. Highway 12 south of State Route 123.

These welcome centers would provide pre-visit information and orientation. One of their most important functions would be to inform visitors about which areas of the park had parking spaces available and which areas were filled to capacity. They could also be used to interpret park themes, present topics that were regional in scope, and provide information regarding regional recreational opportunities.

Services provided at the welcome centers might include permit issuance, fee collection, trip planning, campground and lodging reservations, tour and transportation information, and comfort stations. In addition, existing wilderness information functions could be relocated to the new centers. Shuttle system staging might also be provided.

The welcome centers along State Routes 410, 165, and U.S. Highway 12 would be located within existing public or private facilities, if possible. The National Park Service would seek cooperative arrangements or partnerships with other federal agencies such as the U.S. Forest Service, local communities, or other entities to use existing facilities. If new facilities were needed, environmental documents would be prepared, consistent with the National Environmental Policy Act.

The welcome center along State Route 706 would likely be a new facility, built and operated in partnership with the local communities of Ashford, Elbe, or other entities. This new welcome center would provide services and information similar to the other welcome centers, as well as a theater for presenting park orientation films and other programs.

## Information Systems

In addition to the new welcome centers, the National Park Service would use a variety of systems to inform visitors on the diversity of recreational opportunities within the park and in the corridors leading to the park before they arrived at the park. These systems can also provide real-time information regarding parking availability, traffic and weather conditions, and visitor options. Such information would be readily accessible, affordable, accurate, user-friendly, and would be available prior to and during travel. Among the information systems that may be applied at Mount Rainier are:

- Interactive, electronic, Web-based kiosks at the welcome centers in the road corridor gateways leading to Mount Rainier, which would provide information about recreational opportunities, road, traffic and weather conditions.
- A Web site that would provide the same information as the interactive electronic kiosk.
- Variable or changeable message signs along the corridor, which would provide current information regarding road, traffic and weather conditions. Specific locations would need to be coordinated with responsible agencies such as the Washington State Department of Transportation.
- Highway advisory radio, which would provide information current information regarding road, traffic and weather conditions.
- New technologies such as improved communications via satellite with hand held or in-vehicle devices.

### Transportation in the Park

During periods of high visitation, a lack of sufficient parking is a problem at several of Mount Rainier National Park's popular visitor areas. Under the preferred alternative a park transportation plan would be developed in coordination with regional road corridor and transportation planning. The plan would examine different options for improving transportation in the park, including the use of shuttles, carpooling, parking alternatives (e.g., HOV parking), the use of incentives to encourage visitors not to drive (e.g., providing interpretation services on shuttles, pricing), marketing, and enforcement. The plan would also examine the costs/benefits of the various options. Partnerships with agencies and organizations would be sought in implementing the plan's actions.

Public input also would be sought throughout the development of this implementation plan. In particular, user groups, gateway communities, the Washington Department of Transportation, and other stakeholders would be involved in developing the implementation plan. An environmental document also would be prepared to meet the requirements of the National Environmental Policy Act.

The design and operation of a shuttle system would be the primary focus of the transportation plan. Many benefits would result from establishing a shuttle system. Shuttles would help alleviate congestion in parking lots and along access routes to popular sites and thus help eliminate visitor frustration, reduce the frequency with which parking areas fill up, and provide visitors with an alternate method of accessing popular areas. Employees and residents would have an alternative to driving their own vehicles along road corridors leading to and within the park. Shuttles would give bicyclists and hikers a means to begin a trip at one shuttle stop and end it at another shuttle stop, without shuttling personal vehicles. In addition, shuttle would reduce traffic

congestion, decrease air and noise pollution, improve access, simplify travel within the park, make it easier to see park features, and conserve energy. Shuttles would offer new interpretive opportunities that would enhance visitor enjoyment and protection of resources. Shuttles could also be used to distribute visitors more equitably throughout the park and to reduce crowding by spacing out the timing of visits.

The visitor shuttles would be intended not only to move visitors within the park, but also to enable metropolitan-area residents to travel to the park. Thus, the shuttles would be expected to run beyond the park boundaries. To achieve this goal, the National Park Service would coordinate the in-park shuttle system with regional transportation authorities, county governments, local communities, and business owners. This would include working with the park gateway communities to ensure that adequate support facilities such as food services and comfort stations would be available in communities for visitors who accessed the park via public transit.

Shuttles would be phased in over time in the park as need and user volume warranted, as partners were able to participate, and as funding allowed. Public/private strategies for funding the shuttle system, including the acquisition of shuttles, building shuttle stops, and operating and maintaining the vehicles, would be pursued. When the shuttle system is initiated, the National Park Service would optimize its operation, with continued input from stakeholders.

In summer, the shuttles would operate from the following locations:

- Westside Road
- Longmire
- Paradise
- White River campground/Sunrise
- Mowich Lake
- Carbon River

TABLE 3: SUMMARY OF SHUTTLE SERVICE BY ALTERNATIVE

Area	Alternative 1: No-Action Alternative (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
Westside Road	No shuttles provided.	Shuttle provided in summer.	No shuttles provided.
Longmire	Existing shuttles for park and concession employees would continue operating.	Same as alternative 1, plus visitor shuttles would stop here on the way to Paradise in summer and winter	Same as alternative 2.
Paradise Visitors	Concessioner would provide shuttles for climbing concession guests.	Shuttles provided in summer and winter, in cooperation with communities and regional authorities.	Same as alternative 2.
Employees	Voluntary employee shuttle continues.	Most concession employees and NPS staff required to take shuttles during the peak use period	Same as alternative 2.
White River campground	No shuttles provided.	Shuttle service provided to the parking area adjacent to the campground in summer peak season.	Lower level of shuttle service provided compared to alternative 2, targeting selected users
Sunrise	No shuttles provided.	Shuttles provided in summer; when parking lots full, shuttles would be the only access.	Lower level of shuttle service than in alternative 2, intended for selected group(s) of users.
Carbon River Road	No shuttles provided.	Shuttles provided in summer until a major washout of the road occurs.	Same as alternative 2.
Mowich Lake	No shuttles provided.	Shuttles provided up to new road terminus during summer peak use period.	No shuttles provided.

In winter, a shuttle would also take visitors to Longmire and Paradise.

Many details still need to be worked out regarding the operation of the Mount Rainier shuttles. These include the extent of service, route origins and destinations, frequency of trips, shuttle stop locations, where visitors would park to catch the shuttles, the type and size of the shuttles, who would operate the shuttle system (concessioner or the National Park Service), shuttle passenger fees, what passengers could carry on, and where and how interpretive services would be provided on the shuttles. These details would be addressed in the transportation plan. In addition, impacts associated with operating the shuttle system would be evaluated, such as the environmental impacts associated with the creation of shuttle staging and parking areas.

### Elimination of Overflow Parking

On sunny weekends and holidays during the peak season, the parking areas at the most popular visitor destinations frequently are filled to overflowing. In particular, Paradise and Sunrise often have overfull parking areas. When the parking areas are filled, visitors circle around waiting for a free space, park in unofficial overflow areas (often along road shoulders and sometimes more than a mile distant), or leave. Concerns about the current situation include the following.

- People get frustrated as they try to find a parking space. This detracts from the quality of their experience at the park.

- Overflow parking increases the chance of accidents, especially between pedestrians and motor vehicles.
- Resource damage occurs when people park along road shoulders and crush the vegetation, either with car tires or by foot, or when people create social trails (take shortcuts) to reach their destinations.
- To improve the quality of the visitor experience and reduce resource impacts, the preferred alternative would eliminate all overflow parking. Parking would be allowed in designated spaces at visitor centers, trailheads, viewpoints, and other visitor facilities. Overflow parking areas where visitors have parked in the past would be blocked off and/or no-parking signs would be posted. Parking also would be prohibited in areas when there are public health and safety or traffic congestion concerns.

To minimize its effects, the ban on overflow parking would be implemented in phases and would be coordinated with other actions.

- Limits would not be placed on parking until the shuttle system was operational. Coordination of these two actions would ensure that an effective visitor transportation system would be available and that visitors would have an alternate means of accessing the park's popular destinations.
- Before placing limits on parking, the National Park Service would use media outlets and its own education and information resources to inform park users of the change.
- Additional parking spaces would be designated at some popular sites.
- Information on areas where parking was and was not available would be provided to visitors before they reached the park and

at the park entrances. The intent would be to guide visitors to locations where parking was available.

### **Wilderness Management and Use**

The Mount Rainier Wilderness would be managed using the new zones described in this plan. Both day and overnight use would be managed through the application of resource and visitor experience indicators and standards. Until the new indicators and standards were established, the existing wilderness indicators would be monitored, and existing standards would continue to be followed. Overnight users would continue to be required to obtain permits.

A limited amount of parking would be available at each wilderness trailhead. Once this limit was reached, no overflow parking would be allowed. Trailhead parking limits would reflect use capacities in related wilderness zones. After the shuttles came into service, visitors could take the shuttles to many trailheads.

### **Geologic Hazards**

Mount Rainier poses considerable hazards to humans and facilities. In particular, Longmire and the Cougar Rock and White River campgrounds are in areas where debris flows (the primary geologic hazard in the park) have and will continue to occur. An analysis of the geologic hazards facing the park was done during this planning process (NPS 1997b). Based on available information, it is not possible to predict precisely when or where a debris flow or other geologic event is likely to occur in the park. Consequently, it is difficult to predict the actual risk to people in the park. Employees that live and work at Longmire are exposed to more risk than employees just working at Longmire, and visitors passing through would have even less exposure.

Increased efforts would be made under the preferred alternative to educate and inform visitors and employees about the threat of geologic hazards and what to do if a debris flow or other event occurred. Such efforts might include the following:

- providing additional information in interpretive programs, including programs on the proposed shuttles
- placing warning signs about possible geologic hazards along roadways and in high-risk areas throughout the park
- studying the possibility of building escape trails/routes where they do not currently exist
- developing literature jointly with the U.S. Geological Survey (USGS) that would notify visitors of possible risks and the best actions to take in case of a geologic event, and handing out or posting the information on bulletin boards, at visitor centers, and in public gathering areas parkwide
- placing more detailed geologic hazard information on the USGS Cascade Volcano Observatory's Web site (<http://vulcan.wr.usgs.gov>) and on the park's Web site (<http://www.nps.gov/mora>)
- cooperating with the U.S. Geological Survey and others in monitoring geologic hazards in the park

### **Management of Pack Stock**

Pack stock such as horses, mules, and llamas would be allowed only on the Pacific Crest Trail and Laughingwater Creek Trail. A staging area would be established in the Ohanapcosh area so pack stock groups could access the Laughingwater trail. Allowing the

use of pack stock to continue on the Pacific Crest Trail would provide consistency with the management of this trail outside the park. Although relatively few people use pack stock in Mount Rainier National Park, this action would be taken to reduce impacts on natural resources that are associated with the use of pack stock, including soil erosion and the spread of nonnative plants.

### **Management of Tour Buses**

The preferred alternative would include the management of bus tours as a means of reducing congestion. The following are some actions that could be taken:

- Using bus parking spaces more efficiently, which could include such measures as offering price incentives during less busy times or controlling the times or places of entry and the length of stops.
- Implementing new regulations, such as allowing buses to stop only at certain places and times, or allowing only certain types and sizes of buses in the park.
- Working with bus tour companies to reduce the use of a single trail by large visitor groups. For example, passengers might be directed to specified trail entry points, or they could be split into smaller groups.
- Encouraging tour bus companies to bring visitors into the park on weekdays, when use levels are lower than on weekends.
- Encouraging tour companies to attract new clientele and to offer different types of tours, such as special-interest tours, family tours, or half-day tours.
- Working with gateway communities and regional tourist attractions to provide tour bus service.

- Educating tour bus operators and guides about park regulations.

### **Protection of Air Quality**

The preferred alternative would include measures to reduce air pollutant emission sources within the park boundaries. These could include the following actions:

- increasing public education about the campfire smoke problem in the park
- establishing non-burn days in the park
- limiting campfires to one in each campground loop or one centralized campfire
- banning campfires during inversions and other adverse weather conditions
- continuing to remove wood-burning stoves from employee residences
- requiring tour buses to turn off their engines in parking lots

### **Preservation of Natural Soundscapes**

Mount Rainier National Park offers both a variety of natural sounds and a quietness not found in most urban or suburban environments. Together, these two conditions provide a special dimension to the park experience. Natural sounds, which is the absence of manmade noise, is an important element of the feeling of solitude. The absence of manmade noise also affords visitors an opportunity to hear faint or very distant sounds such as birdcalls or waterfalls. Such experiences provide an important perspective on the vastness of the environment in which the visitor is located, often beyond the visual boundaries determined by trees and terrain.

Existing noise policies would continue to be enforced. The sounds of civilization would

generally be confined to developed areas such as Longmire, Paradise, and Sunrise, and the road corridors that connect the developed areas. If problems arose in the future because of aircraft overflights or land-based noise sources, the following actions would be taken to help ensure that natural sounds would predominate in Mount Rainier National Park.

- The park staff would work with the appropriate Federal Aviation Administration (FAA) regional office and flight standards district office, air tour operators, commercial businesses, and general aviation interests to encourage aircraft to fly outside the park. This could be especially effective for flights where the presence of the park was incidental to the purpose of the flight, such as travel between two cities. Actions that might be considered to encourage pilots to fly outside the park boundaries include identifying the park on navigational charts as a noise-sensitive area, educating pilots about the reasons for keeping a distance from the park, and encouraging pilots to fly in a manner that minimizes noise, in compliance with FAA regulations and advisory circular (i.e., AC 91-36C).
- If tour operators expressed interest in operating air tours over Mount Rainier, the park staff would work with tour operators and all other interested parties to develop an air tour management plan. This approach is required under the National Parks Air Tour Management Act of 2000 (PL 106-181). The air tour management plan would determine conditions under which air tours could occur, such as designating specific routes, altitudes, and time of day restrictions, and would identify particular areas where flights would negatively affect park resources or the maintenance of natural ambient soundscapes. No air tours would be permitted over the park until the air tour management plan was complete.

- Park staff would work with bus tour companies to reduce noise, which could include turning off engines when buses were parked.
- Visitors would be encouraged not to use generators and other noisy equipment.
- Noise generated by NPS management activities would be minimized by regulating administrative functions, such as aircraft use and motorized equipment. Noise would be a consideration in the procurement and use of equipment by the park staff.

### Trail System

The park's trail system would remain largely unchanged, although minor modifications or additions would continue to occur. Trail maintenance would continue to be an important element in minimizing visitor impacts in subalpine and alpine meadows and other sensitive areas.

Some minor modifications would be made to nonwilderness trails to keep visitors on trails. These could include defining trail edges, installing barriers, or widening or narrowing small sections of trails or landings. Nonstructural actions that could be taken to keep people on nonwilderness trails in the Paradise, Sunrise, and Tipsoo Lake areas could include ranger patrols, visitor education, and fines for going off the trail. When large groups arrived, the number of people entering a trail at one time could be managed to reduce group sizes.

### Winter Use

The National Park Service would work with the state to plow the road up to the gate near the park boundary at the Paul Peak trailhead and to establish and maintain a sno-park at the gate for skiers and snowshoers. This area already has a parking area and a vault toilet.

Therefore, implementing this portion of the preferred alternative would only require establishing an agreement with the state. The National Park Service also would work with the state to improve the White River sno-park at the park boundary.

Winter uses largely would be identical to those of the no-action alternative (continue current management). They would include the following:

- Skiing, snowshoeing, and snowboarding would be allowed throughout the park.
- The road from Nisqually to Paradise would be plowed for personal vehicles. The area would be used for snow play, skiing, snowshoeing, snowboarding, and winter camping.
- Drive-in camping at Sunshine Point campground would be available in winter. Snow camping also would be allowed at Paradise, provided there was at least 5 feet of snow. Walk-in or ski-in camping would be encouraged at Ohanapecosh and Cougar Rock.
- A minimum snow depth of 2 feet would be required for winter camping in the wilderness area (this is only a recommendation under the no-action alternative). Permits would be required for overnight wilderness use.
- Supervised snow play would be allowed in the groomed area at Paradise on weekends and holidays, provided there was at least 5 feet of snow. Unsupervised snow play would be allowed in this area on weekdays.

The National Park Service would continue to take measures to reduce risks to park visitors and employees from winter storms, avalanches, and other winter hazards. These actions would include the following:

- posting weather forecasts to inform visitors about current and anticipated conditions
- conducting daily snow surveys to determine hazardous conditions
- posting signs and other media alerting the public to avalanche danger zones
- implementing periodic road or trail closures
- providing physical mitigation of avalanche chute hazards

## **ACTIONS BY GEOGRAPHIC AREA — SUMMER**

### **Westside Road**

Westside Road is subject to frequent washouts along Tahoma Creek, where glacial outbursts have repeatedly scoured out the roadbed, and at the culvert at Fish Creek. Currently, private vehicles are not allowed to cross the washout section to the high ground beyond.

Under the preferred alternative visitors could take shuttles, hike, or ride bicycles along the road. Minor improvements would be made to Westside Road so shuttles could use the road. Pack stock use would not be allowed. Shuttles would drive as far as Klapatche Point and probably would operate from July through September. This period could be extended based on visitor use patterns. Limited interpretation would be provided on the shuttle.

If a washout occurred, visitors would be taken across the damaged area after the waters subsided, then they could catch another shuttle. The National Park Service would accept the stranding of the shuttle bus for several weeks as a normal operational condition. If a large stretch of the road was destroyed by flooding, the future use of the road for shuttle service

would be reexamined, and shuttle service might be discontinued.

The road would be maintained in a manner consistent with the National Historic Landmark District.

Picnic sites would be added at Tahoma Vista, Round Pass/Marine Memorial, and Klapatche Point.

### **Longmire**

The availability of parking would substantially control the level of use of the Longmire area. Signs would be used to eliminate overflow parking by visitors. No new designated parking would be provided. When parking lots were full, people would not be able to stop.

Existing shuttles for park and concession employees would continue operating. Visitors could take shuttles to Longmire, which would stop on the way to Paradise. Existing visitor and administrative facilities would be retained. The former campground would continue to be used for camping by park volunteers and maintained as an important cultural landscape. However, under this alternative a portion of the campground would be reopened to the public for picnicking.

### **Ricksecker Point**

The land inside the loop road would remain largely undeveloped, except for the addition of a limited number of picnic sites and associated parking spaces. A vault or portable toilet also would be added in a previously disturbed area.

### **Paradise**

Under the preferred alternative, the number of parking spaces (physical carrying capacity) and the number of tour buses and shuttles would determine how many people would be able to visit Paradise. When the parking areas

were full, visitors in private vehicles would be encouraged to visit other parts of the park or to visit Paradise at less busy times, such as on weekdays, evenings, or during the fall and spring. Visitors still would have the option of driving through the area when the parking lot was full.

**Visitor and Employee Access.** Most visitors could continue to drive their private vehicles to Paradise. Visitors also would be able to take shuttles to Paradise in summer and winter. Most NPS and concession staff who work at Paradise would be required to take shuttles during the peak-use period. This action would give visitors more opportunities to find parking spaces.

The future shuttle service would be coordinated with the elimination of overflow parking to reduce traffic congestion and ensure effective visitor transportation within the park. The system would be implemented with the cooperation of businesses, local communities, and regional authorities.

**Traffic Circulation.** To provide visitors with better views of the mountain and enable them to better appreciate the cultural resources of the National Historic Landmark District, the direction vehicles drive on the valley road would be reversed on a trial basis. The western half of the Paradise loop road would continue to be open to two-way traffic. Thus, visitors could enter the Paradise area from the east along the valley road and exit to the west along the western half of the Paradise loop road. To achieve this change, the park roads would be modified to ensure visitor safety and smooth traffic flows. This would include modifications in the intersection along the Paradise Valley to Stevens Canyon wye.

The results of the trial period would be evaluated from traffic flow, maintenance, safety, and visitor experience perspectives to determine if this change should be made permanent.

**Parking.** All overflow parking would be prohibited in the Paradise area. This would include eliminating overflow parking in the following areas:

- along the Paradise Valley Road from the Paradise Inn to and beyond the 4th crossing
- along the existing main entry road from the Paradise/Stevens Canyon wye to the upper Paradise parking area
- within the picnic area

Until carrying capacity indicators and standards were established, the number of parking spaces, tour buses, and shuttles would determine how many people would be able to visit Paradise. Except for parking spaces reserved for visitors with disabilities, parking would be available on a first-come, first-served basis. When the parking areas were full, visitors in private vehicles would be redirected to other parts of the park and encouraged to visit Paradise at less busy times.

The parking area would be redesigned to make more effective use of available space, improve circulation, and provide shuttle drop-off areas. The number of designated parking spaces in the existing parking area footprint at Paradise would remain at about 750 spaces. However, the total number of parking spaces would decline with the elimination of overflow parking. This would be partially offset by requiring employees, wilderness climbers, and wilderness campers to use shuttles.

Management techniques could be adopted and refined to manage the parking lots. These could include gating the parking lots and picnic area to ensure that visitors could always drive through the Paradise area but could only stop when parking spaces were available.

**Visitor Center.** A value analysis study performed by the National Park Service in

1996 (NPS 1996e) found that the Henry M. Jackson Memorial Visitor Center does not meet current code requirements or NPS guidelines for egress, accessibility, life and safety, or fire protection. Rehabilitating the building would be very costly. In addition, the building space is inefficient, and large amounts of energy are required to run a snow-melt system to reduce snow loads on the roof. If the snow-melt system were to fail, the structure could collapse from snow loading.

Because of these limitations, the preferred alternative would include removing the existing visitor center and replacing it with a smaller building. The structure would be sustainable and architecturally compatible with the National Historic Landmark District. Concurrently, the Paradise area would be redesigned to improve access, circulation, and parking.

The new facility would provide many of the same visitor services as the current building. There also would be space for NPS and concession support functions. Interpretation at the new Paradise visitor center would focus on the Paradise area rather than the whole park.

The new visitor center would be located within the already disturbed areas. There would be no increase in disturbed ground or asphalt because of this action. A separate site-specific environmental document would be needed to analyze in detail the consequences of building a new visitor center and associated site improvements.

### **Ohanapecosh**

Existing visitor and administrative facilities would be retained. Parking would be expanded in this area within the existing footprint by converting part of the camping and day-use area to about 15 additional designated parking spaces, consistent with the cultural landscape.

A staging area for pack stock groups also would be established in the Ohanapecosh area.

### **White River**

The availability of parking would influence the level of use of the White River area. The number of parking spaces and the number of shuttles would determine how many people would be able to visit this area. Shuttle service would be provided to the White River campground. Because no overflow parking would be allowed, when the parking lot was full, visitors would have the option of accessing the area via the Sunrise shuttle or driving to other areas.

A shuttle staging area for the Sunrise/White River areas would be developed at a location to be determined (see below).

### **Sunrise**

**Visitor Access.** From July through September, visitors could either take a shuttle to Sunrise or drive their private vehicles and park at Sunrise in designated spaces. Once the parking lot was full, visitors would be required to take shuttles to Sunrise or would be directed to other areas.

A staging area for the shuttles, consisting of a parking area, restrooms, and waiting facility, would be provided at a location to be determined. The National Park Service would work with Washington's State Department of Transportation, the U.S. Forest Service, and the Crystal Mountain ski area to find a suitable staging site that would have a low impact on the environment.

**Parking.** Until carrying capacity indicators and standards were established, the number of parking spaces, tour buses, and shuttles would determine how many people would be able to visit Sunrise. When the parking capacity at Sunrise was exceeded, visitors could take the shuttle into the area, or would be directed to

other parts of the park and encouraged to drive to Sunrise at less busy times, such as on weekdays or during the fall.

Parking for tour buses and visitors with disabilities would continue to be provided. The number of designated parking spaces in the main Sunrise parking area would be expanded within the existing footprint (including gravel areas), consistent with the cultural landscape. The number of designated parking spaces for private vehicles at Sunrise would increase from 260 spaces to about 300 spaces. A cultural landscape report would be prepared to aid in the final design. However, because no overflow parking would be allowed, the overall number of parking spaces at Sunrise would decrease.

#### **Visitor and Administrative Facilities.**

Additional picnic sites would be constructed at Sunrise within the existing footprint to accommodate more visitors. The approved plan (*Sunrise Development Concept Plan*, NPS 1992b) to construct a new ranger station and concession facility with concession employee housing to replace Sunrise Lodge would be implemented. Other existing facilities would be retained.

#### **Mowich**

The number of parking spaces and the number of shuttles and tour buses would determine how many people would be able to visit Mowich.

**Visitor Access.** Mowich Lake Road would be closed to vehicle traffic approximately 0.5 mile from the lake, except for administrative uses. Visitors who wanted to visit the lake would then walk from the new parking area to the lake.

To offer an opportunity for more visitors to come to Mowich, without exceeding the area's parking capacity, shuttle service for visitors

would be provided along the entire road, up to a new turnaround about 0.5 mile from the lake. The road would not be paved.

**Parking.** The 50-space parking area at the lake would be removed. To replace this feature, approximately 115 new, designated, parallel-parking spaces would be provided along the shoulders of Mowich Lake Road, running west from the road's new terminus. Some parking spaces would be designated for recreational vehicles and for visitors with disabilities. No overflow parking would be permitted. A turnaround at the new road terminus could be used to drop off passengers and supplies.

The number and location of parking spaces would be managed to meet the goals of protecting park resources and providing diverse recreational opportunities. For example, some spaces could be reserved near the road terminus for visitors staying at the campground and for wilderness campers with permits.

**Camping and Picnicking.** The camping area would be reconfigured to provide designated campsites in the current footprint. New, fully accessible vault toilets would be constructed to replace the existing toilet. Picnic sites would be added to the Mowich Lake area, and new picnic sites would be added near the Paul Peak trailhead.

#### **Carbon River**

Carbon River Road is adjacent to the Carbon River, and some segments of the road are within the floodplain. In some areas, the roadbed is lower than the level of the water. The National Park Service has repeatedly implemented expensive measures to protect the roadbed, such as berming the riverbank, diverting the flow, and repairing the roadbed. The National Park Service cannot continue to make major repairs to this road to ensure long-term vehicular access without adversely affecting river resources.

**Visitor Access.** The Carbon River road would be kept open for personal vehicles as long as possible. Although there would be no restrictions on vehicles, high-clearance vehicles would be recommended. Shuttle service also would be provided for visitors up to the Ipsut Creek campground. A shuttle staging area would be provided outside the park at a location to be determined.

Private vehicles and shuttles would be permitted on the road until a major washout occurred. At that time, the road would be dedicated to nonmotorized uses (hiking and biking). Until that occurred, the availability of parking would largely control the level of use of the area. Administrative vehicles needed for preservation, maintenance, and emergencies would continue to be permitted on the road. The existing historic road corridor would be maintained in a manner consistent with the National Historic Landmark District designation. No pack stock would be allowed on the road.

**Parking.** The designated parking facilities in the area would be maintained, but no overflow parking would be allowed.

**Visitor and Administrative Facilities.** Camping would continue as it is now until there was a major washout of the road, at which time the road would be closed to visitor motorized vehicles. The Ipsut Creek campground would then be converted to a walk-in/bike-in camping area, consistent with the National Historic Landmark District designation.

With the approval of the proposed boundary adjustment (as described below), additional camping and picnic spaces would be provided in the boundary adjustment area near the Carbon River entrance.

In addition, new picnic sites would be added at the existing housing and maintenance area at the Carbon River entrance. However, the

picnic area at Falls Creek would be removed due to its location in a washout area.

The acquisition of land as part of the proposed boundary adjustment discussed below would provide an opportunity to relocate nonhistoric maintenance functions and employee housing to an already disturbed site within the boundary adjustment area. If needed, a separate environmental document would be prepared to support this action.

## **ACTIONS BY GEOGRAPHIC AREA — WINTER**

With a few exceptions, management in the winter would be identical to that under the no-action alternative (continue current management).

### **Westside Road**

As in the no-action alternative, Westside Road would not be plowed and would be managed for skiing and snowshoeing. Visitors would park near the intersection with the Nisqually to Paradise Road.

### **Paradise**

The road from Nisqually to Paradise would continue to be plowed for personal vehicles, and the use of the area for snow play, skiing, snowshoeing, snowboarding, and winter camping would continue as in the no-action alternative (continue current management). As noted above, visitors also would be able to take shuttles to Paradise. (As in the summer actions for this alternative, a staging area for the shuttles would need to be established at a location to be determined.) It is anticipated that the number of winter visitors would continue to increase, which could affect the quality of the winter experience at Paradise. If this occurs, the National Park Service would reevaluate the management of this area in

conformance with the future Paradise winter use study (see “Implementation of the Approved Plan” in “Direction for the Plan”).

### **Ohanapecosh**

Under this alternative, the park staff would continue to work with the state to plow State Route 123 from the park boundary to Ohanapecosh. Skiing, snowshoeing, and camping would be encouraged.

### **White River**

State Route 410 would not be plowed, and no vehicles would be allowed beyond the gate at the park boundary. To encourage winter activities in this part of the park, the National Park Service would work with the state to improve the existing sno-park at the park boundary. Skiing and snowshoeing would continue to be allowed on the road to the campground, as well as beyond the Mather wye (State Route 410).

### **Mowich**

The National Park Service would work with the state to plow the road up to the gate near the park boundary at Paul Peak trailhead, and to establish and maintain a sno-park, using the existing parking area and restrooms at the gate. This action would promote winter activity at the gate area by skiers and snowshoers.

### **Carbon River**

The road would not be plowed, and in the short term, existing uses would continue. Private vehicles would be permitted to drive as far as Ipsut Creek until there was a major washout of the road. Thereafter, the road would be closed to motorized vehicles. Skiing and snowshoeing would be allowed, although this area typically has insufficient snowfall for these activities. Hiking and biking would also be allowed, but use of pack stock would not be permitted.

## **BOUNDARY ADJUSTMENT**

Section 604 of Public Law 95-625 requires the National Park Service in a general management plan to identify any potential changes in park boundaries and to provide the reason for the changes. The only boundary adjustment proposed for the park would be adjacent to the Carbon River entrance. All other issues concerning the park’s boundaries and adjacent land management entities would be solved by programmatic activities involving coordination and cooperation with land managers rather than by making boundary adjustments.

The National Park Service would seek congressional authorization to expand the boundary of Mount Rainier National Park by about 1,063 acres (see map). This boundary change, if authorized, would incorporate lands in the Carbon River Valley, directly adjacent to the current Carbon River entrance of the park.

This boundary change would be proposed to provide for a publicly managed corridor along the upper portion of the Carbon River. This would help protect important wildlife habitat for federally listed threatened and endangered species, including important nesting habitat and designated critical habitat for the marbled murrelet (see the USFWS response letter to the draft plan). Public ownership also would provide additional opportunities for public use and enjoyment of the area and the enhancement of scenic values and recreational opportunities. This action would include providing a publicly managed corridor for the southern terminus of the Foothills Trail.

The area of proposed boundary adjustment includes a mixture of public and private lands. Therefore, a variety of protection approaches would be considered. These would include, but would not be limited to, management by the National Park Service or management by another federal or state agency. Where private lands were involved within the proposed

boundary addition, it would be recommended that any acquisition by the federal government that was authorized by Congress would occur only with the consent of the owner.

Congressional authorization also would be sought to appropriate funds from the Land and Water Conservation Fund to immediately acquire a 210-acre tract of land between Carbon River Road and the Carbon River. The purpose of this acquisition, which is part of the proposed 1,063-acre parcel, would be to develop a drive-in campground and picnic area. These facilities would do the following:

- help the National Park Service meet the demand for recreational camping in the upper Carbon River Valley
- help mitigate the eventual loss of the Ipsut Creek campground as a vehicle-accessible facility
- allow the National Park Service to move its administrative facilities from the Carbon River entrance, where some structures are subject to flooding

If and when the boundary change occurred, the new lands would be zoned and managed accordingly. The visitor facilities, sensitive resource/recreation, primitive (nonwilderness), and administrative zones probably would be applied to the area.

NPS policies and special directive 92-11 instruct that any recommendation to expand park boundaries be preceded by determinations that the added lands would be feasible to administer considering factors such as size, configuration, ownership, and cost, and that other alternatives for management and resource protection have been considered and would not be adequate. Appendix E provides a review of these criteria for boundary adjustments as applied to Mount Rainier National Park.

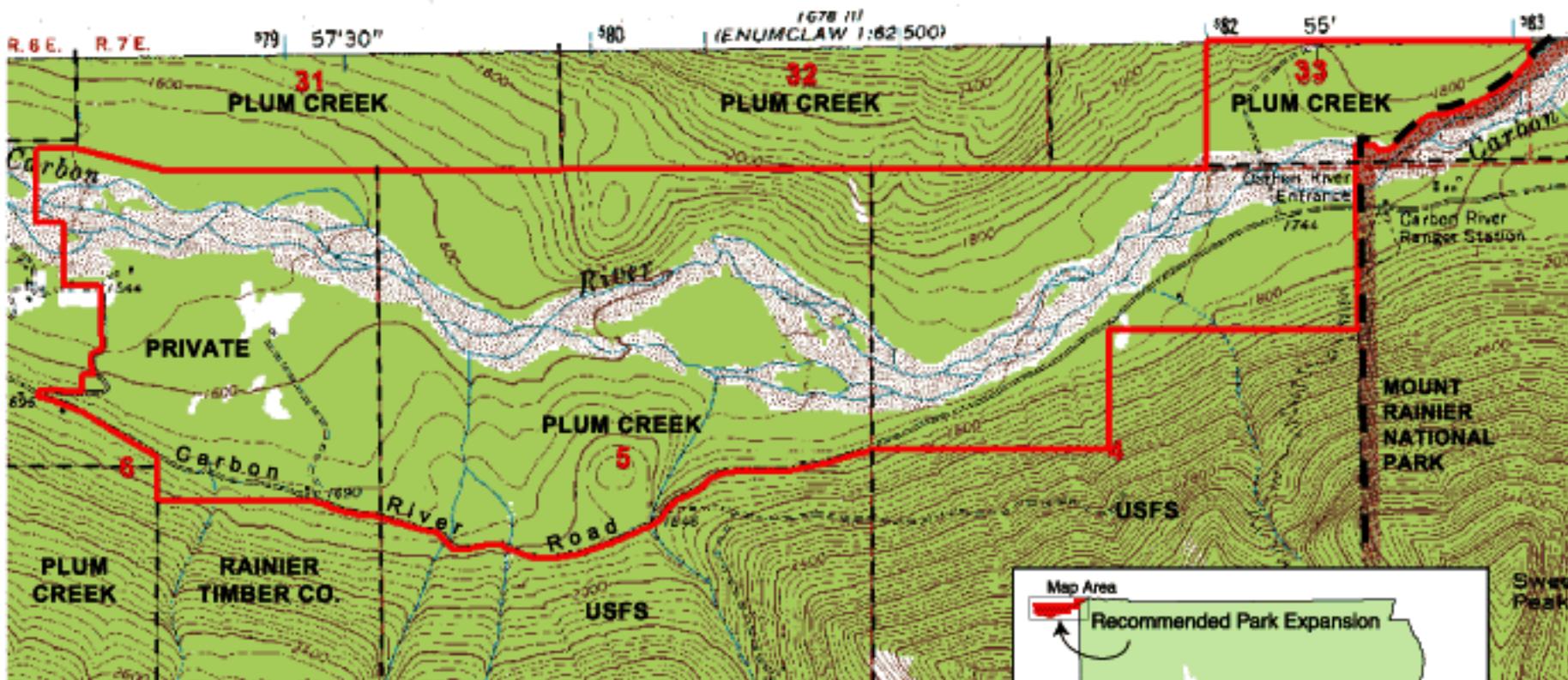
## COSTS AND IMPLEMENTATION

The actions included in the preferred alternative would be implemented over the next 20 years, as funding became available. Actions that would receive the highest priority for implementation would be those that

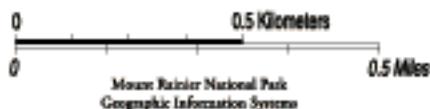
- addressed resource protection needs, particularly information needed for establishing and refining resource-based carrying capacities
- remedied serious infrastructure concerns
- accommodated immediate visitor information, interpretation, or use needs
- would be required before subsequent steps could be taken
- could be accomplished fairly quickly with relatively little time and money

The preliminary cost estimate for implementing the preferred alternative is shown in table 4. The initial gross cost estimate (year 2000 dollars) for constructing new facilities, removing facilities, rehabilitating or restoring areas, and other elements included in the preferred alternative is about \$47.1 million. The figures are intended to give a general indication of costs, and should *not* be used for budgeting purposes. Actual costs to the National Park Service would vary depending on if and when actions were implemented, the size and location of facilities, and contributions by partners and volunteers.

Some of the major capital costs that would be associated with the preferred alternative would include about \$12.7 million for new welcome centers outside the park, \$14 million for a new visitor center to replace the Henry M. Jackson Memorial Visitor Center, and \$16.8 million for shuttles and related facilities. The preliminary cost estimate does not include the cost of land associated with the proposed boundary



- ┌ ┐ Existing Park Boundary
- ▭ Recommended Park Expansion (~1063 acres)



## Proposed Boundary Change Mount Rainier National Park

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adjustment or for staff for operating a shuttle service.

Implementing the preferred alternative would require adding approximately 22 employees to the park staff. Additional staff requirements, in full-time-equivalent employees, would include the following:

Monitoring of resource conditions	2.5
Access and parking lot management	2.0
Interpretation and orientation	12.5
Westside Road services	1.4
Ranger patrols for zone limits enforcement	3.6
Mowich Lake Road services	0.2
Total additional staff required	22.2

Because of the limited financial resources available, the park staff would need to pursue various means to fully implement the preferred alternative, such as seeking additional funding sources and donations, developing cooperative agreements, and jointly using facilities with other agencies.

- In the past, private landowners have sometimes asked the National Park Service to purchase or acquire lands outside the park. Sometimes a nonprofit group is willing to purchase the land and donate it to the National Park Service. The National Park Service would seek these types of opportunities to reduce the cost to the federal

government of acquiring the proposed new lands and constructing administrative and visitor facilities outside the park.

- The park staff would seek partnerships with other agencies or groups to help share in the costs of staffing or operating facilities or providing services. This could include establishing a partnership or agreement with the U.S. Forest Service to provide pre-trip and wilderness information at Forest Service facilities along all corridors leading to the park, improving the management of visitors using trails that connect forest and park lands, and seeking partnership arrangements for operating proposed visitor welcome centers outside the park.
- The National Park Service could consider inviting commercial operators to provide some of the services and facilities proposed in this alternative. Details would be worked out in the upcoming commercial services plan. For example, the proposed shuttle systems might be considered for commercial operation.

Congressional authority would be needed for the proposed Carbon River boundary adjustment, as was done for Tahoma Woods.

TABLE 4: GROSS COST ESTIMATES FOR ALTERNATIVE 2 (PREFERRED ALTERNATIVE)

<b>Action</b>	<b>Gross Costs</b>
Improvements outside the park	
State Route 706 welcome center	\$5,310,000
Packwood area welcome center	2,003,500
Northeast welcome centers	3,718,500
Northwest welcome center	1,637,500
Improvements inside the park —	
Ricksecker Point — picnicking, parking, restrooms	\$127,000
Paradise — rehabilitate and provide new exhibits	1,500,000
Paradise — replace visitor center	9,122,000
Paradise — rehabilitate access, circulation, and parking	3,337,500
Ohanapecosh — staging area for pack stock	88,500
Sunrise — add some additional parking and picnic sites	118,000
SR 410 — sno park	9,500
Carbon River — reclaim parking and picnic areas and add new picnic sites	19,500
Mowich Lake road/Paul Peak trailhead — add new picnic sites and sno-park	15,500
Mowich Lake — camping and picnicking improvements	74,000
Vehicle access and transportation	
South area road system — improvements	\$678,500
Paradise shuttles and staging	9,571,000
Westside Road — improvements	767,000
Westside Road shuttles and staging	2,006,000
Northeast area shuttles — vehicles and staging	3,134,000
Northeast area road system — improvements	1,193,500
Carbon River Road — shuttle and staging	926,500
Mowich Lake road — shuttle and staging	1,163,500
Mowich Lake — road and parking improvements	339,500
Northwest area road system — improvements	295,000
<b>Total</b>	<b>\$47,155,500</b>

## ALTERNATIVE 3: ADDITIONAL VISITOR USE OPPORTUNITIES

Alternative 3 is similar to the preferred alternative (alternative 2) in many respects. Both alternatives would set visitor carrying capacities for the wilderness and nonwilderness areas of the park, eliminate overflow parking, and emphasize providing information to visitors before they arrived at the park. However, alternative 3 would strive to provide some additional visitor use opportunities with minimal resource impacts. Unless otherwise stated in the “Direction for the Plan” section, all existing park facilities would continue to be maintained and existing recreational uses would continue to be permitted. Past decisions regarding facilities, such as construction of the ranger station/concession facility to replace Sunrise Lodge, also would be implemented.

### PROPOSED ZONING

The same zones as described for the preferred alternative would be applied under alternative 3. The wilderness and nonwilderness (summer and winter) zone allocation also would be identical with the preferred alternative, with two exceptions: in alternative 3, Westside Road would be designated as a visitor facilities zone in the summer, and State Route 410 would be designated a visitor facilities zone in winter. For a description of the allocation of zones, see the description of alternative 2. For a summary of the uses permitted in each zone, see appendix C.

### PARKWIDE ACTIONS

Alternative 3 would be the same as the preferred alternative with respect to

- visitor use and resource management (carrying capacity)
- interpretation, education, information, and orientation

- elimination of overflow parking
- wilderness management and use
- geologic hazards
- management of tour buses
- protection of air quality
- preservation of natural soundscape
- trail system

Under alternative 3, the operation of visitor shuttles would be different than the preferred alternative (alternative 2) as shown in table 3, above. The major differences are listed below.

- No shuttles would be provided along Westside Road.
- A lower level of shuttle service would be provided for the White River campground and Sunrise than in alternative 2.
- No shuttles would be provided along Mowich Lake Road.

Alternative 3 would eliminate pack stock, such as horses and llamas, on most of the park’s trails. Pack stock would continue to be permitted on the Pacific Crest Trail and the Laughingwater Creek Trail to access it, Westside Road, Carbon River Road, and the Klapatche Point and Wonderland Trails from Klapatche Point to Ipsut Creek campground. This action would be taken to reduce potential impacts from pack stock, such as soil erosion and the spread of nonnative plants. Pack stock would continue to be allowed on the Pacific Crest Trail to be consistent with opportunities on this trail outside the park. Pack stock also would be permitted on the two roads under this alternative to provide additional opportunities for this use in the park. As in alternative 2, a pack stock staging area would be established in the Ohanapecosh area in order for pack stock to access the Laughingwater Creek trail.

## **ACTIONS BY GEOGRAPHIC AREA — SUMMER**

Management initiatives and recreation opportunities that would be different from the preferred alternative are as follows.

### **Westside Road**

Visitors could drive privately owned high-clearance vehicles (but not other types of private vehicles) on the road beyond Dry Creek, and they could hike, ride bikes, and use pack stock. Minor improvements would be made so that private high-clearance vehicles could use the road. Beyond the Dry Creek parking area, the road would be maintained in a manner consistent with the National Historic Landmark District designation and for high-clearance vehicles. However, if a major section of the road was lost due to flooding, the future use of the road would be reexamined. This might include closing the road to vehicular traffic. As in the preferred alternative, picnic sites would be added at Tahoma Vista, Round Pass/Marine Memorial, and Klapatche Point. No shuttle service would be provided under this alternative, but visitors without high-clearance vehicles would continue to be able to park their vehicles near the junction of the Westside and Nisqually to Paradise Roads and hike or bicycle along the road.

### **Longmire**

Longmire would be managed in the same way as described under the preferred alternative. In both alternatives the former Longmire campground would be reopened to the public for picnicking as well as continue to be used for volunteer-in-park camping.

### **Paradise**

Under alternative 3, there would be two major differences in the way Paradise would be

managed in comparison to the preferred alternative:

- The number of designated parking spaces in the general Paradise developed area would be increased from about 750 to 1,250 (about 500 more spaces than in the preferred alternative). Most of the new parking spaces would be designated along the road west of the Henry M. Jackson Memorial Visitor Center.
- The Henry M. Jackson Memorial Visitor Center would be rehabilitated to meet minimum code requirements and to improve the visitor experience. Existing uses would continue in rehabilitated spaces. The building heating, ventilation, and electrical systems would be upgraded to meet code minimums. Fire detection, fire suppression, and smoke evacuation systems would be installed. The roof snow-melting system would continue to have high annual operational costs as well as risk of failure, which could have a significant effect on the structural integrity of the building.

### **Ohanapecosh**

This area would be managed in the same way as described under the preferred alternative except that more parking spaces would be provided in the camping/day-use area. About 20 additional parking spaces would be designated within the existing footprint. As in the preferred alternative, a staging area for pack stock groups also would be established in the Ohanapecosh area.

### **White River and Sunrise**

This area would be managed in almost the same way as under the preferred alternative. In both alternatives shuttles would be provided for visitors. However, in alternative 3 the shuttle system would be more limited.

## **Mowich**

Additional improvements would be made to Mowich Lake road, in comparison to the preferred alternative. Unlike alternative 2, the last 0.5 mile of the road would not be closed. Instead, to reduce the amount of sedimentation and pollutants entering the lake, the last 0.75 mile of gravel road would be surfaced and other mitigation measures, such as sediment traps or filters, would be employed. Because the end of the road to Mowich Lake would be paved, there would be an opportunity to provide additional parking spaces along the road. About 170 parallel parking spaces would be provided along the road for the last 0.75 mile. As in the preferred alternative, no overflow parking would be permitted, and use of the new parking spaces would be managed.

Day and overnight visitors would continue to drive their private vehicles to Mowich Lake until the parking area at the lake was full, but no shuttle service would be offered under this alternative. As in the preferred alternative, new picnic sites would be added, and the camping area would be reconfigured; this alternative would include a larger number of campsites.

## **Carbon River**

With one exception, Carbon River would be managed in the same way in this alternative as in the preferred alternative. Current uses of Carbon River Road would continue, including the use of private motor vehicles. In addition, a shuttle service would be established. Alternative 3 would also provide for the use of pack stock on Carbon River Road. As in the preferred alternative, if a large portion of the road washed out in the future, the management and use of the road for vehicles would be reexamined. This could include closing the road to private vehicle use and continuing to provide access via a shuttle service. The picnic area at Falls Creek also would be removed due to its location in a washout area.

## **ACTIONS BY GEOGRAPHIC AREA — WINTER**

### **Westside Road**

As under the preferred alternative, the road would not be plowed. Under this alternative, however, to provide an opportunity for more visitors to see the western part of the park in the winter, visitors would be able to drive their high-clearance vehicles (but not other types of vehicles) up to Tahoma Vista or to the snow-line. Past this point visitors could ski and snowshoe along the road. As in the preferred alternative, if major road rebuilding was required due to flooding, vehicle use of the road would be reexamined.

### **Paradise**

Paradise would be managed the same way as in the preferred alternative. The road from Nisqually to Paradise would continue to be plowed for personal vehicles. Visitors would also have the option of taking shuttles to Paradise. (As in the summer actions for this alternative, a staging area for the shuttles would need to be established at a location to be determined.)

### **Ohanapecosh**

Under this alternative, the National Park Service would work with the state to plow State Route 123 and Stevens Canyon Road from the park boundary through Ohanapecosh to the Grove of the Patriarchs. The National Park Service also would work with the state to establish a snow-park at the end of the plowed road. As in the preferred alternative, skiing and snowshoeing would be encouraged from Ohanapecosh.

### **White River**

Under alternative 3, State Route 410 would be plowed to provide access for private vehicles

from the park boundary to the White River entrance. The National Park Service would work with the state to establish a sno-park at the end of the plowed road, consisting of a parking area and restroom. As in the preferred alternative, the existing sno-park at the park entrance would be maintained, and skiing and snowshoeing would be encouraged on the road from the White River entrance up to and on to the Fryingpan Creek trail, as well as beyond the Mather wye (State Route 410).

**Carbon River**

Carbon River would be managed almost the same way as in the preferred alternative. The road would not be plowed, and in the short term, existing uses would continue. Private vehicles would be permitted to drive as far as Ipsut Creek until there was a major washout of the road. Thereafter, the road would be closed to motorized vehicles. Skiing, snowshoeing, hiking and biking would be allowed. Unlike the preferred alternative, in alternative 3 the use of pack stock would be permitted.

**BOUNDARY ADJUSTMENT**

The same boundary adjustment proposed adjacent to the Carbon River entrance in alternative 2 would also be proposed under alternative 3. This boundary change, if authorized, would provide for a publicly managed corridor along the upper portion of the Carbon River, which in turn would provide added protection of important wildlife habitat and more opportunities for public use and enjoyment of the area. In addition to the proposed boundary change authorization for the Carbon River area, Congressional authorization would be sought to appropriate funds to immediately acquire an approximately 210-acre tract located between Carbon River Road and the Carbon River. The purpose of this acquisition would be to provide for the development of a public drive-in campground and picnic area and to allow the National Park Service to move

administrative/support facilities from the Carbon River entrance.

**COSTS AND IMPLEMENTATION**

As in the preferred alternative, new developments and management actions proposed under alternative 3 would be implemented over the next 20 years, as funding became available. Funding priorities would be the same as in the preferred alternative. The National Park Service would also seek the same types of alternative funding, including but not limited to, donations, cooperative agreements, and joint use of facilities with other agencies.

The preliminary cost estimate for implementing alternative 3 is shown in table 5. The initial gross cost estimate in year 2000 dollars for constructing new facilities, removing facilities, rehabilitating or restoring areas, and other actions included in alternative 3 is about \$42.8 million. This estimate does not include the cost of land associated with the proposed boundary adjustment or costs for staff operating a shuttle service. As with the preferred alternative, the costs in table 5 are intended to give a very general idea of costs and should *not* be used for budgeting purposes.

Implementation of alternative 3 would require adding approximately 21 employees to the park staff. Additional staff requirements, in full-time-equivalent employees, would include the following:

Monitoring of resource conditions	2.5
Access and parking lot management	2.0
Interpretation and orientation	11.5
Westside Road services	1.0
Ranger patrols for zone limits enforcement	3.6
Mowich Lake Road services	0.2
Total additional staff required	20.8

TABLE 5: GROSS COST ESTIMATES FOR ALTERNATIVE 3

<b>Action</b>	<b>Gross Costs</b>
Improvements outside the park	
State Route 706 corridor welcome center	5,310,000
Packwood area welcome center	2,003,500
Northeast welcome center	2,891,000
Northwest welcome centers	1,639,500
Improvements inside the park	
Ricksecker Point — picnicking, parking, restrooms	127,000
Paradise — rehabilitate/design new Henry M. Jackson Memorial Visitor Center exhibits	1,000,000
Rehabilitate visitor center	13,000,000
Rehabilitate access, circulation, parking	1,180,000
Ohanapeocosh — sno park	9,500
Ohanapeocosh — staging area for pack stock	74,000
White River sno park	9,500
Sunrise — add parking and picnicking	118,000
Carbon River — reclaim parking/picnic areas and add new picnic sites	19,500
Mowich Lake road/Paul Peak trailhead — add new picnic sites and sno park	15,500
Mowich Lake — camping and picnicking improvements	74,000
Vehicle access and transportation	
South area road system — improvements	678,500
Paradise shuttles and staging	9,571,000
Northeast area road system — improvements	501,500
Northwest area road system — improvements	295,000
Westside Road — improvements	354,000
Carbon River — shuttle and staging	2,553,500
Mowich Lake — road and parking	1,359,500
<b>Total</b>	<b>\$42,784,000</b>

## MITIGATING MEASURES

The following mitigating measures would be applied to avoid or minimize potential impacts on natural and cultural resources from construction activities and visitor use. Except where specifically noted, these measures would apply to all alternatives.

### NATURAL RESOURCES

#### Water Quality

Mitigating measures, such as sediment traps placed along a roadside, would keep related impacts on water quality to a minimum.

Best management practices, such as the use of silt fences, would be followed to ensure that construction-related effects were minimal and to prevent long-term impacts on water quality, wetlands, and aquatic species.

“Blue bags” would be used by climbers and winter campers where restroom facilities were not available to avoid water pollution due to human waste.

A dust abatement program would be used. Standard dust abatement measures would include watering or otherwise stabilizing soils, covering haul trucks, employing speed limits on unpaved roads, minimizing vegetation clearing, and promptly revegetating after construction was completed.

The park’s spill prevention and pollution program for hazardous materials would be used and would be updated on a regular basis. Standard measures could include hazardous materials storage and handling procedures; spill containment, cleanup, and reporting procedures; and limitations of refueling and other hazardous activities to upland/nonsensitive sites.

New structures would be sited outside floodplains.

For new facilities, and to the extent practicable for existing facilities, stormwater management measures would be implemented to reduce non-point-source pollution discharge from roads, parking lots, and other impervious surfaces. Such actions could include oil/sediment separators, street sweeping, infiltration beds, and use of permeable surfaces and vegetated or natural filters to trap or filter stormwater runoff.

#### Soils and Vegetation

Roadside mowing would be timed to assist in preventing the spread of noxious weed species.

Efforts to reduce dust and soil loss would continue to be undertaken, as appropriate, for all excavation, grading, construction, and other dust-generating and soil-disturbing activities. These actions could include the following:

- sprinkling unpaved construction areas with water to reduce fugitive dust emissions and covering or seeding disturbed areas
- imposing speed limits for construction vehicles in unpaved areas
- covering trucks hauling dirt and debris
- salvage and reuse of native soils

Work on campsites, roads, and other visitor facilities both in and outside the park would continue to be planned to reduce impacts on vegetation. Site-specific surveys would identify areas to avoid due to terrain or resource concerns. Proposed locations for picnic sites or campsites would be surveyed for possible special status plant species, and such sites would be designed and maintained to discourage social (informal, user-created) trail development.

To reduce the effects of habitat loss, construction activities would be planned and implemented to avoid or minimize impacts. If impacts could not be avoided, construction activities would be planned and implemented in a way that facilitated the restoration of native communities.

Revegetation plans would be developed for areas impacted by major construction activities, and would continue to require the use of native species, as well as plant and topsoil salvage. Revegetation plans would continue to specify such features as seed and plant sources, seed mixes, soil preparation, fertilizer, and mulching. Salvaged vegetation, rather than new planting or seeding, would be used to the extent possible. To maintain genetic integrity, all seeds used in restoration would be collected in the project area. Plant material would be propagated from seeds or plant stock collected in the project area. Use of nonnative species or genetic materials would be considered only where deemed necessary to maintain a cultural landscape (e.g., the lawns at Longmire) or to prevent severe resource damage, and would be approved by the park's plant ecologist.

Restoration activities would be instituted immediately after construction was completed. Monitoring would be carried out to ensure that revegetation was successful, plantings were maintained, and unsuccessful plant materials were replaced.

Where parking is to be removed, rehabilitation would include removal of the existing surface, tillage to improve infiltration, revegetation with native species, and application of effective soil mulch.

Whenever possible, specimen trees would be retained and protected from construction-related damage. Trees removed during construction would be used in trail construction, mulch, or other construction material, or would remain on-site as habitat.

## **Wildlife**

To the extent possible, new or rehabilitated facilities would be sited to avoid the following sensitive wildlife habitats:

- major wildlife travel areas or corridors
- feeding and resting areas
- bear-denning sites
- nesting or brood-rearing areas
- native fish habitat
- sensitive amphibian habitat

Construction activities would be timed to avoid sensitive periods, such as nesting or spawning seasons. Ongoing visitor use and park operational activities could be restricted if their potential level of damage or disturbance warranted doing so.

Measures would be taken to reduce the potential for wildlife to get food from humans. Wildlife-proof garbage containers would be required in developed areas (including visitor centers, picnic areas, trails, interpretive waysides, and campgrounds). Food storage poles, designed to prevent bears and rodents from eating campers' food, would be installed at wilderness campsites. Visitors would continue to be educated about the need to refrain from feeding wildlife through the use of signs attached to picnic tables and posted on kiosks in campgrounds and picnic areas.

## **Special Status Species**

Surveys would be conducted for special status species before deciding on taking any action that might cause harm. In consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Washington Departments of Fish and Wildlife and Natural Resources, measures would be taken to protect any sensitive species whether identified through surveys or presumed to occur.

Construction projects would be designed so that trees suitable for the following would not be removed:

- marbled murrelet habitat, which includes trees greater than 32 inches diameter at breast height with suitable branches for nest platforms and high canopy closure (Ralph et al. 1995)
- spotted owl nest trees (broken tops, naturally occurring cavities), roost sites (relatively dense vegetation with high canopy closure); or foraging areas (high canopy closure and complex structure)

It is possible that construction activities (e.g., noise, dust, increased human presence) could adversely affect individual spotted owls or marbled murrelets if they were found nesting and rearing young in the immediate vicinity of a project area. If nest sites were discovered after construction activities began, work would be halted and there would be additional consultation with the U.S. Fish and Wildlife Service. Consultation would determine the need for additional mitigating measures.

Guidelines to avoid impacts on spotted owls and marbled murrelets are listed in the accompanying text boxes. Whenever possible, construction activities would be timed to avoid the sensitive nesting period for northern spotted owls between March 1 and September 30. If necessary, some construction activities might be permitted during the late nesting season from August 1 to September 30. Construction activities also would be timed to avoid the sensitive nesting period for marbled murrelets between April 1 and September 15; if necessary, some construction activities might be permitted during the late nesting season, from August 6 to September 15. Similarly, to the degree possible, sensitive spawning times for fish and sensitive periods for other species would also be avoided. Construction activities taking place during these sensitive periods would proceed following appropriate consultation with the U.S.

Fish and Wildlife Service and the National Marine Fisheries Service.

**GUIDELINES TO FOLLOW TO AVOID IMPACTS ON SPOTTED OWLS**

Whenever possible, complete all work between September 30 and March 1.

For work in areas below 4,800 feet, between March 1 and July 31:

- Helicopters would need to fly at least 2,600 feet above the tree canopy level.
- Blasting operations would need to be conducted at least 1 mile away from suitable habitat.
- Motor vehicle and chainsaw noise would have to occur at least 0.25 mile away from suitable habitat.

For work in areas below 4,800 feet, between August 1 to September 30:

- Helicopters would need to fly at least 2,600 feet above the tree canopy level.
- Blasting operations would need to be conducted at least 0.5 mile away from suitable habitat.
- Motor vehicle and chainsaw noise would have to occur at least 0.25 mile away from suitable habitat.

**GUIDELINES TO FOLLOW TO AVOID IMPACTS ON MARBLED MURRELETS**

Whenever possible, complete all work between September 15 and April 1.

For work in areas below 3,500 feet, between April 1 to August 5:

- Helicopters would need to fly at least 2,600 feet above the tree canopy level.
- Blasting operations would need to be conducted at least one mile away from suitable habitat.
- Motor vehicle and chainsaw noise would have to occur at least 0.25 mile away from suitable habitat.

For work in areas below 3,500 feet, between August 6 and September 15:

- Helicopters would need to fly at least 2,600 feet above the tree canopy level.
- Blasting operations would need to be conducted at least 0.5 mile away from suitable habitat.
- Motor vehicle and chainsaw noise would have to occur at least 0.25 mile away from suitable habitat.

Park managers would determine the food plants and breeding habitat for the valley silverspot, whulge checkerspot, and Fender's soliperlan stonefly and conduct surveys for these plants (butterflies) and aquatic habitats (stonefly) prior to any proposed actions.

Park managers would also continue to survey downed logs and other appropriate habitats for special status salamanders prior to approval and implementation of preferred alternatives, such as changes to wilderness campsites and roadside tree removal. Surveys would also continue to be conducted for other species that may occur within the park, particularly when these species could be affected by proposed actions.

To complete ongoing consultation with the U.S. Fish and Wildlife Service, a programmatic agreement to analyze the effects of routine park operations would be completed. For activities and actions not covered by this programmatic agreement, the park would continue to consult with the U.S. Fish and Wildlife Service on a case-by-case basis as specific actions were formulated.

## CULTURAL RESOURCES

In consultation with the Washington State Historic Preservation Office, tribal officials, the Advisory Council on Historic Preservation, and other interested parties, under all the alternatives the park staff would continue to apply the following measures to avoid or minimize

impacts on historic properties, archeological resources, and ethnographic resources.

All ground-disturbing undertakings, such as the addition of campsites, restroom facilities, and parking areas, would be assessed for the presence of archeological resources, and surveys would be conducted before the implementation of the preferred alternative. Archeological monitoring would also be continued during construction in areas considered to have potential for undisturbed resources, to ensure that sites were avoided and to evaluate uncovered resources. If archeological resources were identified and could not be avoided by project redesign, data recovery excavations would be completed before construction.

If unknown archeological resources were discovered during construction, work in that location would stop until the resources were properly recorded and evaluated. Measures would be taken to avoid further resource impacts or to mitigate their loss or disturbance. In compliance with the Native American Graves Protection and Repatriation Act of 1990, the park staff would also notify and consult with concerned tribal representatives regarding the treatment of human remains and funerary and sacred objects should these be discovered.

Tribal officials would be consulted before actions were implemented that would have the potential to affect ethnographic resources. The National Park Service would continue to abide by existing cooperative agreements and would pursue additional agreements with culturally affiliated tribes to avoid resource impacts, allow access for traditional gathering and other approved activities, and minimize potential use conflicts in culturally sensitive areas.

The park's National Historic Landmark District would be protected to the greatest extent possible by ensuring that any new construction within the district or within viewshed proximity would be compatible with the district's historic character and setting and would preserve con-

tributing elements of the cultural landscape. Cultural resource impacts resulting from visitor use would also be carefully monitored, and measures would be carried out to divert visitors from culturally sensitive areas and to protect such resources from damage.

All undertakings affecting historic buildings, structures, and contributing elements of the cultural landscape would be carried out in accordance with the park's design guidelines, *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c), and *Guidelines for the Treatment of Cultural Landscapes* (NPS 1996d).

If adverse effects on historic buildings, structures, and contributing cultural landscape elements could not be avoided, appropriate documentation would be carried out in accordance with the standards and guidelines of the Historic American Buildings Survey (HABS) and the Historic American Engineering Record (HAER). Other possible mitigating measures would be developed and implemented as necessary in consultation with the State Historic Preservation Office, the Advisory Council on Historic Preservation, tribal officials, and other interested parties.

### **GEOLOGIC HAZARDS (AVALANCHES)**

The park staff would continue to take the following measures parkwide to reduce the risk of avalanches to park visitors and employees.

- Conduct daily snow surveys to determine hazardous conditions.
- Post daily weather forecasts (updated as needed), including avalanche forecasts from the National Weather Center, to inform visitors about current park conditions.
- Post signs and other media alerting the public to avalanche danger zones
- Close roads during high hazard periods.

The following measures would be used specifically for alternative 3, where new winter access and road plowing along State Route 410 would occur.

- Snow surveys would be completed twice daily as dictated by avalanche terrain and conditions; this would include snow pit analysis to determine snow conditions at various snow depths.
- New avalanche hazard signs would be installed along State Route 410. These signs would inform visitors of the avalanche hazards along the road and would also identify "no stopping" areas along the road where high avalanche hazards exist.

## ENVIRONMENTALLY PREFERRED ALTERNATIVE

Environmentally preferred is defined as “the alternative that will promote the national environmental policy as expressed in §101 of the National Environmental Policy Act. Section 101 states that “. . . it is the continuing responsibility of the Federal Government to . . .

- (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
- (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
- (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;
- (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life’s amenities; and
- (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.”

The environmentally preferred alternative is the NPS preferred alternative for the *Mount Rainier National Park General Management Plan*. This alternative satisfies the national environmental goals: the alternative provides a high level of protection of natural and cultural resources while concurrently providing for a wide range of neutral and beneficial uses of the environment. The alternative maintains an environment that supports a diversity and variety of individual choices. And it integrates resource protection with an appropriate range of visitor uses.

The preferred alternative surpasses the other alternatives in realizing the full range of national

environmental policy goals in section 101. The no-action alternative does not provide as much resource protection as the preferred alternative — more resource impacts would be expected with increasing use levels in the no-action alternative. Visitor experience impacts also would likely increase under this alternative. Thus, compared to the preferred alternative, the no-action alternative does not meet as well the following national environmental policy goals:

- attain the widest range of beneficial uses of the environment without degradation
- preserve important natural aspects and maintain an environment that supports diversity and variety of individual choice
- achieve a balance between population and resource use

Alternative 3 provides some additional visitor use opportunities and access to Mount Rainier National Park. However, there would be a higher potential for impacts on northern spotted owls — a federally listed threatened and state-listed endangered species — under this alternative compared to the preferred alternative. It also presents greater threats to public health and safety than the preferred alternative: opening State Route 410 in the winter would expose visitors to avalanche hazards. Thus, alternative 3 does not meet the following policy goals as well as the preferred alternative:

- attain the widest range of beneficial uses without resource degradation and risk to health or safety
- preserve important natural aspects
- enhance the quality of renewable resources

## **ALTERNATIVES AND ACTIONS CONSIDERED BUT NOT EVALUATED FURTHER**

Several other actions and alternative concepts were considered by the planning team for managing Mount Rainier but were eliminated from further analysis. Two of the initial alternatives were dropped because there were very few differences in the management directions and zoning schemes compared to the other alternatives. The following actions were not analyzed because they were found not to be viable or feasible under current conditions.

### **ESTABLISH A PARKWIDE EMPLOYEE TRANSPORTATION SYSTEM**

This concept was considered as a means of reducing vehicular parking demands and encouraging a shift towards more efficient and environmentally sensitive transportation modes. The system was dropped from detailed evaluation because of the high cost of transporting employees to remote locations in the park. However, shuttles are currently being used to take employees to Tahoma Woods, Longmire and Paradise.

### **INSTITUTE AN EMPLOYEE SHUTTLE TO SUNRISE AND THE WHITE RIVER CAMPGROUND**

Instituting an employee shuttle would free up spaces for visitors to park in these areas. However, this option was not considered because of the small number of employees that work in this area (who also work different schedules). Sunrise also is a remote location for employees, with no nearby community; it would take a lot of time for a shuttle to pick up a few employees scattered over a large area, resulting in a high cost of running a shuttle for a long distance.

### **BUILD NEW PARKING FACILITIES IN THE PARK**

Building new parking facilities was not evaluated in detail due to the restrictions imposed by wilderness boundaries and the negative impacts of parking expansion on the park's environment. Building additional parking areas in the park was also not considered viable because it would introduce an increased urban character and would interfere with visual quality. The locations where additional parking is most needed are within the National Historic Landmark District, and new parking areas would be likely to conflict with and degrade the cultural landscape in the historic district. Some alternatives include modified parking lots in certain areas.

### **INSTITUTE A PARKWIDE VOLUNTARY REMOTE PARKING AND SHUTTLE SYSTEM**

This concept would maintain the existing level of private vehicle access and parking within the park. Staging areas would be developed outside the park near the entrance stations. Visitors in private vehicles could voluntarily park at the staging areas and transfer to shuttles to access key activity areas. Shuttle transfer points could be located within the park to accommodate travel between major activity areas. The park-wide voluntary shuttle system concept was not forwarded for detailed analysis due to its low ridership potential. Few visitors would be likely to use a voluntary shuttle system based on experience in other recreational and urban settings.

### **REQUIRE REMOTE PARKING AND SHUTTLES PARKWIDE**

A parkwide mandatory remote parking and shuttle concept was studied to identify the level of shuttle services, equipment, and facilities that would be required for all day-use visitors to park their vehicles near the park boundary and to take public transportation to primary activity areas throughout Mount Rainier. Private vehicle trips through the park along State Route 123 and State Route 410 would be allowed. But all other private vehicular, day-use traffic would be prohibited on park roads beyond the entrance gates. This concept would require a fleet of approximately 200 transit vehicles and more than 40 acres of parking lots. The high cost of a parkwide mandatory system and the negative impacts of such a system on visitor convenience and visitor experience would make this concept unworkable in Mount Rainier.

### **INSTITUTE A MANDATORY TRAILHEAD SHUTTLE**

The concept of prohibiting parking at trailheads along the Nisqually entrance road on weekends in the summer and of providing a special shuttle for trail users was considered. This concept was set aside due to high costs and the need to develop new parking areas that would duplicate existing parking, and because all but a few trailheads have enough parking spaces to serve the trails reached from the trailhead.

### **INITIATE HORSE WAGON TOURS**

The use of horse-drawn wagons was considered as a means of bringing visitors from a remote parking area to activity areas along Carbon River Road. This idea was dropped due to the high costs of maintaining the wagons and caring for the horses, the need for extensive maintenance of the unpaved road to ensure an acceptable quality of ride for visitors, and the potential for introducing exotic species into the park.

### **INITIATE SNOW COACH TOURS**

The use of snow coaches to provide access to activity centers and to bring visitors into remote areas in the park during the winter was evaluated conceptually. There was no local experience on which to base estimates of demand for snow coach tours. The largest similar operation is at Yellowstone National Park. Based on Yellowstone values, the passenger fares for snow coach service could range from \$40 to \$90 per person. Also, the heavy, wet snow prevalent in Mount Rainier would be difficult to groom adequately to afford a comfortable ride to visitors. Because of the high costs, uncertain market conditions, and inappropriate snow conditions, this concept was dropped from further evaluation.

### **RELOCATE THE WHITE RIVER AND COUGAR ROCK CAMPGROUNDS AND THE LONGMIRE FACILITIES**

As noted earlier, the White River and Cougar Rock campgrounds and the Longmire area are in high hazard areas. Debris flows in these areas could result in high casualty rates and the destruction of facilities (see the “Affected Environment” chapter). Consequently, it has been suggested that these facilities be removed or moved to safer locations. This idea was not incorporated in the alternatives for several reasons. Although there is a risk associated with keeping these facilities open for public use, it is not possible to predict when a debris flow would occur at these sites — an event could occur tomorrow or in the next 100 years. A debris flow could also occur at times when few people are in the areas, such as the winter. No other suitable locations exist in the park to move all of these facilities to due to geologic hazards and designated wilderness. In addition, moving the facilities would have an adverse impact on the National Historic Landmark District. Finally, the public strongly opposed this action when it was proposed during this planning process — people preferred to accept the risk rather than lose the chance to stay at the campgrounds. Instead, the

alternatives emphasized informing and educating people about the geologic hazards and the risk of staying in these areas.

### **ELIMINATE OR EXPAND THE PARADISE SNOW PLAY AREA**

Snow play (sledding) is a recreational use that is currently permitted only at Paradise (supervised on weekends and holidays). Proposals were made during the planning process to eliminate the Paradise snow play area as well as to allow unrestricted snow play in most of the park. Both actions were rejected. Expanding the locations where snow play occurs would pose major safety hazards for visitors. Park staffing is inadequate for grooming and adequately patrolling other areas. Although this activity does not contribute to satisfying the purposes for which the park was established, and can occur in other areas besides Mount Rainier (e.g., White Pass and Crystal Mountain), it has been permitted at Paradise for many years. The existing activity is not inconsistent with the purposes of the park, is believed to have had a minimal impact on park resources, and is an activity enjoyed by many people. Thus, snow play would continue to be permitted only at Paradise under all of the alternatives.

### **ELIMINATE SNOWBOARDING IN THE PARK**

Snowboarding has been a permitted recreational use in Mount Rainier. Concerns have been raised regarding the appropriateness of this activity, given that it can occur in other areas outside the park and can impact vegetation and soils when conducted inappropriately. However, there is no direct evidence that snowboarding is impacting underlying vegetation in the park, provided that the snow is of sufficient depth. The existing activity also is not inconsistent with the purposes of the park, has minimal impact on park resources, and is enjoyed by many people. Thus, snowboarding would continue to be permitted under all of the alternatives.

### **SET A CARRYING CAPACITY FOR WINTER USE AND SET LIMITS ON SNOW CAMPING AT PARADISE**

This action was not carried forth because winter use levels have not been increasing at a rate that is believed to threaten desired resource and social conditions in the park. Paradise receives the highest level of winter use in the park. Snow camping, cross-country skiing, snowshoeing, and snowboarding are not known to be causing resource damage, assuming these activities only occur when snow levels are of sufficient depth. Although this plan does not set winter carrying capacities, winter uses would be studied and monitored for resource impacts. If use levels substantially increased in the future and overcrowding occurred, or if unacceptable resource impacts were found to be occurring, winter use carrying capacities could be established.

### **REOPEN WESTSIDE ROAD TO ALL PRIVATE VEHICLES**

Since flooding in 1992, Westside Road has been closed to private motor vehicles at Dry Creek. The road could be repaired to allow all private vehicles to drive to the end of the road. This action was not pursued due to the potential for future floods to wash out the road, the cost in repairing the road, and liability issues. Users also enjoy being able to hike and bike in this area without encountering motor vehicles, and there have not been many requests to reopen the road to motor vehicles. Instead, the alternatives examine the possibility of opening the road to limited use by high-clearance vehicles, permitting a shuttle on the road, and keeping the road closed to motor vehicles.

### **COMPLETELY REHABILITATE THE HENRY M. JACKSON MEMORIAL VISITOR CENTER**

This action was rejected because rehabilitating the structure would be very costly given the

many problems with the building. Over the long term, the cost of maintaining the existing visitor center would be greater than the cost of building and maintaining a new, smaller visitor center. Even if the visitor center was completely rehabilitated, it would continue to look out of place in the cultural landscape and the National Historic Landmark District. The large building

also would continue to be expensive to heat, and large amounts of space still would be likely not to be able to be effectively used. (Under alternative 3 the visitor center would be rehabilitated to meet minimum health and safety and accessibility standards and to provide some visitor experience improvements.)

## SUMMARY OF ALTERNATIVES

Table 6 provides an overview of the key differences among the alternatives for managing Mount Rainier National Park for the next 20 years. As discussed previously, alternative 1, the no-action alternative, would continue current management practices into the future. The two action alternatives are alternative 2, the preferred alternative, and alternative 3, which would provide additional visitor use opportunities.

Table 7 provides more information on the features of each of the alternatives. This includes both parkwide management actions and actions that would be implemented within specific geographic areas. More detailed descriptions of the various features of the alternatives can be

found throughout this “Alternatives, Including the Preferred Alternative” chapter.

Table 8 summarizes the impacts of the alternatives. Detailed information on the impacts evaluation is provided in the “Environmental Consequences” chapter. The table highlights only long-term effects, because short-term impacts (most of which would be associated with construction) would occur for only a limited period of time and would be mitigated to the extent that they would become negligible or minor.

**TABLE 6: SUMMARY OF IMPORTANT DIFFERENCES AMONG THE ALTERNATIVES**

Feature	Alternative 1: No Action (Continue Current Management)	Alternative 2: Proposed Action	Alternative 3: Additional Visitor Use Opportunities
Henry M. Jackson Memorial Visitor Center	Continue to use	Replace	Refurbish
Use a visitor carrying capacity framework to ensure the protection of park resources and quality of the visitor experience	No	Yes	Yes
Provide shuttles to reduce the need for parking	No	Yes	Yes
Eliminate overflow parking	No	Yes	Yes, but provide additional parking spaces
Allow privately owned motor vehicles on Westside Road	No	No, but access by shuttles	Yes
Use welcome centers outside the park to direct summer traffic to areas with available capacity	No	Yes	Yes
Reduce use of pack stock on trails	No	Yes	Yes, and more stock use than alternative 2
Increase management of tour buses	No	Yes	Yes
Boundary adjustment and land acquisition in the Carbon River area	No	Yes	Yes
Plow State Route 410 in the winter to the White River entrance and State Route 123/Stevens Canyon Road through Ohanapecosh to the Grove of the Patriarchs	No	No	Yes
Gross cost estimate	\$0	\$47,155,500	\$42,784,000

TABLE 7: SUMMARY OF THE ALTERNATIVES

	Alternative 1: No-Action Alternative (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
<b>Focus of Alternative</b>	Respond to issues on a case-by-case basis. No major new visitor use management initiatives.	Comprehensive approach with emphasis on resource protection while providing for additional visitor use opportunities.	Protect resources while providing more opportunities for visitor use in different ways than alternative 2.
<b>Parkwide Actions</b>			
Park zoning	Maintain existing zoning based on “Statement for Management” (NPS 1988b) and <i>Wilderness Management Plan</i> (NPS 1992c).	Establish new prescriptive management zones as identified through the general management planning process.	Same as alternative 2, except with different zones for Westside Road and State Route 410.
Resource and visitor use management	No major new initiatives to manage visitors. Do not establish visitor carrying capacities in the park.	Establish carrying capacity framework. Identify indicators and standards for resource conditions and visitor experiences.	Same as alternative 2.
Interpretation, education, information, and orientation	Rehabilitate park interpretive programs and exhibits as part of the ongoing interpretive program.	Rehabilitate park interpretive programs and exhibits as part of the ongoing interpretive program. Provide more in-depth and focused interpretation at visitor centers and museums.	Same as alternative 2.
	Maintain the Henry M. Jackson Memorial Visitor Center in its current condition.	Replace the Henry M. Jackson Memorial Visitor Center with a new, smaller, visitor center.	Rehabilitate the Henry M. Jackson Memorial Visitor Center to meet minimum code requirements and improve visitor experiences.
	Work with partners to provide information at existing visitor contact stations, but provide no new visitor facilities outside the park.	Establish new welcome centers on major roads leading to the park and use other means to provide visitors with information, orientation, and interpretive services.	Same as alternative 2.
	Maintain wilderness information centers in their current locations.	Incorporate wilderness information centers in the new visitor facilities.	Same as alternative 2.
Wilderness day and overnight use	Manage wilderness according to <i>Wilderness Management Plan</i> (NPS 1992c). Follow the zones and standards in the plan.	Establish new management zones and identify indicators and standards for resource conditions and visitor experiences that address day use and overnight use.	Same as alternative 2.
	Regulate overnight use in the wilderness area through permits.	Same as alternative 1.	Same as alternative 1.
Trailhead access	Allow overflow parking at all trailheads.	Limit parking to designated spaces only.	Same as alternative 2.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
Winter overnight use	Continue drive-in winter camping at Sunshine Point near the Nisqually entrance. Allow camping at Paradise when snow depth is at least 5 feet.	Same as alternative 1.	Same as alternative 1.
	Informally encourage a 2-foot snow depth minimum for camping in the wilderness area.	Formally adopt a 2-foot snow depth minimum for camping in the wilderness area.	Same as alternative 2.
Trail system	No new management initiatives. Address management issues as time and funds allow.	Provide minor physical modifications to non-wilderness trails to keep visitors on the trails. Implement such management actions as more intensive visitor education, ranger patrols, signs, and fines for going off-trail.	Same as alternative 2.
Geologic hazards	Continue current efforts to alert visitors to potential geologic hazards such as debris flows, volcanic eruptions, and glacial outburst floods.	Take additional steps to educate visitors and employees about the threat of geologic hazards and actions to take in case of specific events. This could include better publications, Web sites, warning signs, and evaluation of additional escape trails or routes.	Same as alternative 2.
Air quality	Work with partners to maintain and improve air quality, but do not initiate new efforts.	Take additional actions to reduce emission sources within the park, such as increasing public education, limiting the number of campfires, establishing no-burn days, or banning campfires during critical weather conditions.	Same as alternative 2.
Preserving natural soundscapes	Enforce existing noise policies in the wilderness area.	Enforce existing noise policies in the wilderness area. If problems arise due to aircraft overflights or land-based noise sources, implement additional actions to control noise.	Same as alternative 2.
Management of pack stock	Allow pack stock on designated trails and roads.	Allow pack stock on the Pacific Crest Trail and Laughingwater Creek Trail to access it. Establish a staging area for pack stock groups in the Ohanapecoh area.	Allow pack stock on the Pacific Crest Trail, Laughingwater Creek Trail, Westside Road, Carbon River Road, and connecting trails from Ipsut Creek campground to Westside Road. Establish a staging area for pack stock groups in the Ohanapecoh area.
Management of tour buses	No new efforts to manage tour buses.	Implement tour bus management procedures, such as more efficient use of bus parking spaces, limits on locations and times for buses stopping, and encouraging tours at non-peak times.	Same as alternative 2.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	Alternative 1: No-Action (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
Boundary	No changes to the park boundary.	Implement (subject to congressional approval) a boundary adjustment of approximately 1,063 acres at the Carbon River entrance.	Same as alternative 2.
<b>Actions by Geographic Area</b>			
Westside Road — Summer			
Visitor access	Private vehicles could continue to drive up to the existing road closure at the Dry Creek parking area.  Visitors could park near junction with the Nisqually to Paradise Road.  No shuttles.  Continue closure to vehicles beyond Dry Creek.	No private vehicle access.  Same as alternative 1.  Provide a visitor shuttle during the peak season, with shuttle staging area outside the park.  Maintain the road for shuttles, and make minor improvements to allow shuttle service. If there is a major washout, re-examine the future use of the road for shuttle service.	Allow high-clearance private vehicles only.  Same as alternative 1.  Provide no shuttles.  Maintain the road for high-clearance vehicles, and make minor improvements to allow use by these vehicles. If a major washout occurs, re-examine the future use of the road for vehicles.
Visitor facilities	No new visitor facilities.	Provide new picnic sites at Tahoma Vista, Round Pass/Maine Memorial and Klappatche Point.	Same as alternative 2.
Activities	Encourage bicycling, hiking, and pack stock.	Encourage hiking and bicycling, but no pack stock.	Same as alternative 1.
Longmire — Summer			
Resource and visitor use management	No major new initiatives to manage visitor use.	Implement resource and visitor experience indicators and standards. Until these are adopted, use the number of parking spaces (physical carrying capacity) to manage visitor use.	Same as alternative 2.
Parking	Allow overflow parking.	Prohibit overflow parking.	Same as alternative 2.
Campground	Use for volunteer-in-park camping.	Same as alternative 1, plus open part of the area for public picnicking.	Same as alternative 2.
Employee access	Maintain existing shuttles for park and concession employees.	Same as alternative 1.	Same as alternative 1.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
<b>Ricksecker Point — Summer</b>			
Visitor facilities	No new visitor facilities.	Add several walk-in picnic sites and associated parking spaces.	Same as alternative 2.
<b>Paradise — Summer</b>			
Resource and visitor use management	No major new initiatives to manage visitor use.	Implement resource and visitor experience indicators and standards. Until these are adopted, use the number of parking spaces, tour buses, and shuttles (physical carrying capacity) to manage visitor use.	Same as alternative 2.
Visitor access	Visitors could continue to drive private vehicles to Paradise, with parking on a first-come, first-served basis.	Most visitors could drive private vehicles to Paradise, with parking on a first-come, first-served basis.	Same as alternative 2.
	Use shuttles for climbing concession guests.	Same as alternative 1, plus provide shuttle service for all visitors during peak-use period.	Same as alternative 2.
Employee access	Provide an employee shuttle.	Require concession employees and most NPS staff to take shuttles during the peak-use period.	Same as alternative 2.
Traffic flow circulation	Continue current direction of traffic flow (two-way road to the Paradise Inn parking lot, becoming a one-way road past the inn and along Paradise Valley Road).	On a trial basis, reverse direction of traffic flow on the Paradise Valley Road.	Same as alternative 2.
Parking	Provide 750 designated parking spaces and allow overflow parking for approximately 500 additional cars.	Redesign the parking lot to be more efficient and improve circulation. Maintain the number of designated parking spaces at about 750 spaces. Prohibit overflow parking.	Redesign the parking lot to be more efficient and improve circulation. Provide about 1,250 designated parking spaces, with new parking spaces along the road west of the visitor center.
	No new initiatives to manage the use of parking spaces.	Manage the mix of parking spaces available for day-use visitors, tour buses, and inn guests to provide for efficient use of designated spaces.	Same as alternative 2.
Henry M. Jackson Memorial Visitor Center	Maintain but do not rehabilitate the visitor center.	Replace the visitor center with a smaller visitor center.	Rehabilitate the visitor center to meet minimum code requirements and improve the visitor experience.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
<b>Ohanapecosh — Summer</b>			
Parking	Maintain existing facilities.	Provide about 15 more parking spaces within the existing footprint.	Provide about 20 more parking spaces within the existing footprint.
<b>White River — Summer</b>			
Resource and visitor use management	No major new initiatives to manage visitor use.	Implement resource and visitor experience indicators and standards. Until these are adopted, use the number of parking spaces and shuttles (physical carrying capacity) to manage visitor use.	Same as alternative 2.
Visitor access	All visitors could continue to drive private vehicles into White River on a first-come, first-served basis.	Provide shuttle service to the public parking area adjacent to the campground.	Same as alternative 2, except provide a lower level of shuttle service.
<b>Sunrise — Summer</b>			
Resource and visitor use management	No major new initiatives to manage visitor use.	Implement resource and visitor experience indicators and standards. Until these are adopted, use the number of parking spaces, tour buses, and shuttles (physical carrying capacity) to manage visitor use.	Same as alternative 2, except provide a lower level of shuttle service.
Visitor access	All visitors could continue to drive to Sunrise, with parking on a first-come, first-served basis.  No shuttles.	Visitors could drive to Sunrise until the parking lot is filled.  Provide shuttle service to Sunrise. When the main parking lot is full, require all visitors to take shuttles.	Same as alternative 2.  Same as alternative 2
Parking	Continue to provide 260 designated parking spaces for vehicles.	Develop a shuttle staging area at a location to be determined outside the park.  Provide additional designated parking spaces within the existing footprint (including gravel areas), consistent with the cultural landscape (up to 300 spaces).	Same as alternative 2.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
	Allow overflow parking for up to 340 vehicles.	Eliminate overflow parking, which would decrease the availability of parking.	Same as alternative 2.
	No new initiatives to manage the use of parking spaces.	Manage the mix of parking spaces for day-use visitors and tour buses to provide for efficient use of designated parking.	Same as alternative 2.
Visitor and administrative facilities	Maintain existing facilities.	Place additional picnic facilities within the existing footprint.	Same as alternative 2.
<b>Mowich Lake — Summer</b>			
Resource and visitor use management	No major new initiatives to manage visitor use.	Implement resource and visitor experience indicators and standards. Until these are adopted, use the number of parking spaces and shuttles (physical carrying capacity) to manage visitor use.	Same as alternative 2 except shuttles would not be used to manage visitor use.
Visitor access	Visitors could continue to drive to Mowich Lake.	Visitors could drive to a new road terminus, about 0.5 mile from the lake, and then walk to the lake.	Same as alternative 1.
	No shuttles.	Provide shuttles along the road to the new terminus. Develop a shuttle staging area outside the park.	Same as alternative 1.
	Maintain the gravel road.	Maintain the gravel road.	Surface the last 0.75-mile of the gravel road to the lake.
Parking	Maintain the existing 50 designated parking spaces.	Remove the existing designated parking spaces and provide parallel parking spaces for about 115 vehicles along the road's shoulders, west of the road's new terminus.	Same as alternative 1, but provide about 170 designated parallel parking spaces along the last 0.75 mile of the road.
	Allow overflow parking along the roadway.	Allow no overflow parking.	Same as alternative 2.
	No new initiatives to manage the use of parking spaces.	Manage a mix of parking spaces for day-use visitors and campers to provide for the efficient use of designated parking spaces.	Same as alternative 2.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
Camping and picnicking	Visitors could continue to walk to camping area in the existing disturbed area at the end of the road. No designated campsites would be provided.  Maintain existing picnic sites.	Reconfigure the existing camping area to provide designated campsites.  Add picnic sites at Mowich Lake and locate new picnic sites at Paul Peak.	Same as alternative 2, except provide more campsites.  Same as alternative 2.
Carbon River Area — Summer			
Resource and visitor use management	No major new initiatives to manage visitor use.	Implement resource and visitor experience indicators and standards. Until these are adopted, use the number of parking spaces (physical carrying capacity) and shuttles to manage visitor use.	Same as alternative 2.
Visitor access	Visitors could continue to drive, hike, bike, or use pack stock to Ipsut Creek.  No shuttles.  Maintain the road, and continue to repair major washouts.	Visitors could drive to Ipsut Creek until a major stretch of road washes out. Subsequently, close the road to private motor vehicles hikers and bikers could continue to use the road.  Provide shuttles along the entire road to Ipsut Creek. This includes establishing a shuttle staging area outside the park.  Repair and maintain the road in a manner consistent with the National Historic Landmark District designation.	Same as alternative 2 plus allow the ofuse pack stock along the road to Ipsut Creek.  Same as alternative 2.  Same as alternative 2.
Parking	Allow pack stock. Maintain existing facilities and overflow parking.	Do not allow pack stock. Same as alternative 1, but discontinue overflow parking.	Same as alternative 1. Same as alternative 2.
Visitor and administrative facilities	Maintain the Ipsut Creek campground.  Maintain the existing picnic sites at Ipsut Creek campground and Falls Creek.	When major washout closes the road, convert Ipsut Creek campground to a walk-in, bicycle-in campground.  Same as alternative 1, except remove the Falls Creek picnic area; also, in conjunction with the recommended boundary adjustment, provide new picnic sites at the existing entrance and housing/maintenance area.	Same as alternative 2.  Same as alternative 2.

ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
	No new facilities.	In conjunction with the recommend boundary adjustment, develop a new drive-in campground and picnic area outside the current boundary.	Same as alternative 2.
	Maintain existing administrative facilities.	In conjunction with recommended boundary adjustment, relocate nonhistoric maintenance facilities and employee housing to a developed site in the proposed boundary adjustment area.	Same as alternative 2.
<b>Westside Road — Winter</b>			
Plowing and vehicle access	No plowing. Visitors could continue to drive up to gate near the junction with the Nisqually to Paradise road junction.	Same as alternative 1.	No plowing. Allow private, high-clearance vehicles up to Tahoma Vista or snowline. If a major washout occurs, re-examine the future use of the road.
<b>Paradise — Winter</b>			
Plowing and vehicle access	Plow the road from Nisqually to Paradise and allow visitors to drive to Paradise.	Same as alternative 1, but also give visitors the option of taking a shuttle to Paradise. Establish a staging area for the shuttles.	Same as alternative 1.
Snow play	Allow only in the designated area, and only when there is at least 5 feet of snow cover.	Same as alternative 1.	Same as alternative 1.
<b>Ohanapecosh — Winter</b>			
Plowing and vehicle access	Plow State Route 123 for private vehicles from the park boundary to Ohanapecosh.  Maintain existing parking facilities.	Same as alternative 1.  Same as alternative 1.	Plow State Route 123 for private vehicles from the park boundary to the Grove of Patriarchs.  Same as alternative 1, but work with the state to provide a sno-park at the end of the plowed road.
Activities	Visitors could continue to ski, snowshoe, and snowboard.	Encourage skiing, snowshoeing, and snowboarding.	Same as alternative 2.
<b>White River — Winter</b>			
Plowing and vehicle access	No plowing.  No motor vehicles allowed past the gate at the park boundary.  Work with the state to maintain the existing sno-park, but do not improve the facility.	Same as alternative 1.  Same as alternative 1.  Work with the state to improve the existing sno-park.	Plow State Route 410 for private vehicles from the park boundary to the White River entrance.  Allow motor vehicles up to the White River entrance.  Maintain the existing sno-park, and work with the state to provide a new sno-park at the end of the plowed road.

TABLE 7: SUMMARY OF THE ALTERNATIVES (Continued)

	<b>Alternative 1: No-Action Alternative (Continue Current Management)</b>	<b>Alternative 2: Preferred Alternative</b>	<b>Alternative 3: Additional Visitor Use Opportunities</b>
Activities	Allow skiing and snowshoeing on the road to the campground and beyond the Mather wye (State Route 410).	Same as alternative 1.	Encourage skiing and snowshoeing on the road from the White River entrance to the Fryingpan Creek area, as well as beyond the Mather wye.
Mowich — Winter			
Plowing and vehicle access	No plowing.	Work with the state to plow the road for private vehicles to the gate near the park boundary at the Paul Peak trailhead.	Same as alternative 2.
	Visitors could drive on the road only up to the gate at Paul Peak trailhead or to the snowline.	Same as alternative 1.	Same as alternative 1.
	No new facilities.	Work with the state to provide a sno-park at the gate near the park boundary.	Same as alternative 2.
Carbon River Area — Winter			
Plowing and vehicle access	No plowing. Visitors could continue to drive as far as Ipsut Creek, except during temporary closures (such as heavy snow or downed trees).	Same as alternative 1. When there is a major washout of the road, re-examine use.	No plowing. Prohibit private motor vehicles and allow hiking and bicycling only.

TABLE 8: SUMMARY OF IMPACTS

Impact Topic	Alternative 1: No-Action Alternative (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
<b>Natural Resources</b>			
Air quality	This alternative would result in a minor adverse impact on air quality resulting from increased park visitation.	Minor beneficial impact would result compared to alternative 1 through the use of visitor shuttles to replace some private vehicles, by taking other measures to control air pollution sources within the park, and by using carrying capacity framework to indicate when air protection management actions were needed.	Impacts would be similar to alternative 2.
Water quality and water resources	Increasing human use would adversely affect water quality by increasing levels of sediments, pollutants (primarily from motor vehicles), and nutrients in the lakes and streams. Impacts would be minor and localized.	Minor to moderate beneficial impacts from implementing a carrying capacity framework and better design of reconfigured areas. Preserving land in the boundary adjustment area would have a moderate beneficial impact.	Impacts would be similar to alternative 2.
Floodplains	Minor to moderate adverse impacts on floodplain values along small sections of several rivers and streams would occur due to levee maintenance and riverbank protection.	Most impacts would be similar to alternative 1. Moderate benefits would occur from not maintaining bank protections along Westside and Carbon River Roads following a major washout.	Impacts would be similar to alternative 2.
Wetlands	No impact on wetlands would occur because measures would be implemented to avoid wetland areas.	Impacts would be similar to alternative 1.	Impacts would be similar to alternative 1.
Soils and vegetation	Increased visitor activities would have minor, long-term, adverse impacts on soils and vegetation, with moderate impacts in some high-use areas, such as Paradise Meadows and Spray Park.	A minor to moderate beneficial effect would result from preserving forests and riparian habitat within boundary adjustment area and implementing a carrying capacity framework. Minor adverse impacts in localized areas would result from modifying or constructing parking lots, picnic areas, and the replacement visitor center at Paradise.	Impacts similar to alternative 2, except that there would be a higher potential for minor adverse impacts in localized areas due to more trails being open to stock use and increases in use at Paradise and Mowich. Minor adverse effects also would result from rehabilitating the Henry M. Jackson Memorial Visitor Center.

TABLE 8: SUMMARY OF IMPACTS (Continued)

Impact Topic	Alternative 1: No-Action Alternative (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
<b>Wildlife</b>	Adverse wildlife impacts would be negligible to minor. Increased human use would displace or disturb wildlife, condition wildlife to associate food with people, and injure or kill wildlife in collisions with motor vehicles.	Implementing proposed boundary adjustment and a carrying capacity framework would have minor to moderate long-term beneficial effects. Minor short-term adverse impacts in localized areas would result from construction projects and opening Westside Road to shuttles.	In addition to the impacts in alternative 2, minor to moderate, adverse, long-term impacts would result from opening the Westside Road to private motor vehicles.
<b>Special Status Species</b>	Mitigating measures would minimize potential effects of slight increases in visitor use that could disturb special status species or their habitats. Alternative 1 would be unlikely to adversely affect these species.	This alternative would be unlikely to adversely affect special status species or habitats. Opening Westside Road to shuttles may affect, but would not be likely to adversely affect, the northern spotted owl, marbled murrelet, and northern goshawk.	This alternative has potential to adversely affect northern spotted owls nesting near State Route 410 when winter plowing occurs. Opening Westside Road to private vehicles might affect, but not likely to adversely affect, northern spotted owl, marbled murrelet, and northern goshawk. No other special status species likely to be adversely affected.
<b>Geologic Hazards</b>			
	Visitors and employees exposed to volcanic and nonvolcanic geologic hazards because many existing development sites would remain in hazard zones. These conditions would present negligible to major impacts due to risks to future visitors and employees.	Major to negligible long-term impacts due to volcanic and nonvolcanic hazards would continue. Minor beneficial effects from disseminating additional information on safety hazards and from removing facilities at Carbon River entrance.	Impacts would be similar to alternative 2, but there would be an additional moderate to major adverse impact due to avalanche hazards associated with the opening of a portion of State Route 410 in the winter.
<b>Cultural Resources</b>			
Archeological Resources	Visitor increases would have no adverse effects because established resource protection measures would be used.	Same as alternative 1. With the application of appropriate mitigation measures, construction activities would have a minor to negligible impact, although there could be an adverse effect on unknown resources.	Impacts would be similar to alternative 2.
Ethnographic resources	No adverse effects on either the ability of Native Americans to procure plants in park or on known traditional cultural properties.	Impacts would be similar to alternative 1.	Impacts would be similar to alternative 1.

TABLE 8: SUMMARY OF IMPACTS (Continued)

Impact Topic	Alternative 1: No-Action Alternative (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
Historic resources, including National Landmark Historic District	No adverse effects would result from this alternative.	No adverse effects from this alternative; beneficial effects would result from reversing traffic flow on Paradise Valley Road and from eliminating overflow parking, which would help reestablish the historic roadside character of the district and reduce effects on visual character.	No adverse effects would result from this alternative. Beneficial effects would be similar to alternative 2.
Henry M. Jackson Memorial Visitor Center	Retaining structure in its current capacity would have no adverse effect on the building because its historical integrity would be preserved.	Removing this facility would have no adverse effect because mitigation approved by the state historic preservation officer would be implemented.	Rehabilitating structure according to standards for historic structures would have no adverse effect on the building should it be eligible for listing on the National Register of Historic Places.
<b>Visitor Experience</b>			
Visitor access	Negligible effect during off-peak periods. Continued congestion and inconvenient parking would adversely affect visitor access at peak-use times. This would be a long-term major adverse impact.	Visitor access at peak times improved by reducing congestion and providing shuttles, resulting in moderate beneficial effects. Minor adverse impacts could result when some visitors inconvenienced and/or displaced by restrictions on overflow parking. Some people might not have access to Mowich Lake, a minor adverse impact. If road was closed due to major flood damage there would be a moderate to major long-term adverse impact.	Visitor access at peak times improved by reducing congestion and providing shuttles, resulting in moderate beneficial effects. Minor adverse impacts could result when some visitors inconvenienced by restrictions on overflow parking. Eliminating overflow parking at Sunrise and providing a lower level of shuttle service than in alternative 2 would have a minor to moderate adverse impact. If Carbon River Road closed after a major washout, there would be a moderate to major long-term adverse impact.
Range and enjoyment of activities	Negligible effect during non-peak times. There would be no substantial change in the range of available visitor activities, although congestion at times of peak use would cause major adverse impacts on visitor enjoyment in the long term.	No major activities would be eliminated or added, but reductions in congestion would have a major beneficial effect on visitor experience and enjoyment. If Carbon River Road closed by a major washout, there would be a moderate to major adverse impact on visitor experiences.	Impacts would be similar to alternative 2, but added winter uses areas at Westside Road, Grove of the Patriarchs, and access along State Route 410 would be a minor beneficial effect.
Convenience of information	Negligible effect during nonpeak periods. During peak-use times continued practices would have a major adverse impact on convenient access to information because of crowding at available facilities.	Major beneficial impacts would result from making information in the park and gateway communities widely available.	Impacts would be similar to alternative 2.

TABLE 8: SUMMARY OF IMPACTS (Continued)

Impact Topic	Alternative 1: No-Action Alternative (Continue Current Management)	Alternative 2: Preferred Alternative	Alternative 3: Additional Visitor Use Opportunities
Wilderness values and experiences	In most of the wilderness area during off-peak periods, visitors would continue to find outstanding opportunities for solitude and for primitive, unconfined recreation. Long-term minor to moderate adverse impacts on peak-period summer wilderness users and their experiences would continue in or near major day use areas, near roads and trailheads, and along major climbing routes.	Opportunities for solitude and for primitive, unconfined recreation would be maintained in most wilderness areas and improved in some areas, resulting in a moderate beneficial impact. However, increased restrictions could cause a minor adverse impact on some wilderness users who might feel their access was adversely affected.	Impacts would be similar to alternative 2.
<b>Socioeconomic Environment</b>			
Regional context	There would not be any new park employment or new construction employment. Impacts from increased visitation would be negligible.	Beneficial impacts would result from increased park employment and construction, and the park's attraction to regional tourists. Impacts would be minor in relation to the regional economy.	The contribution of increased park employment and construction would be greater than under alternative 2, but would still be a relatively minor factor in the regional economy.
Gateway communities	Modest increases in park visitors would increase visitor expenditures in gateway communities, producing beneficial minor impacts.	Moderate beneficial socioeconomic impacts would result from welcome centers, shuttle staging areas, park construction activities, and increased park visitation.	Impacts would be similar to alternative 2.
Regional recreational opportunities	Regional recreational opportunities would not change from implementing alternative 1. Therefore, there would be a negligible impact.	Improvements to existing opportunities in the park would produce a minor beneficial impact on regional recreational opportunities.	Impacts would be similar to alternative 2.
Concessions	Impacts on park concessioners and other commercial businesses would be negligible, but positive, due to higher seasonal business activity associated with increased park visitation.	Beneficial economic impacts on park concessioners and other commercial businesses would be minor.	Impacts would be similar to alternative 2.

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# Affected Environment



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## INTRODUCTION

This chapter describes the existing environment of Mount Rainier National Park and the surrounding region. It is focused on the park resources, uses, facilities, and socioeconomic characteristics that have the potential to be affected by the alternatives if they were implemented. Some features such as floodplains and endangered species are discussed because they provide context or must be considered in an environmental impact statement.

There are numerous sources of information on the natural and human environment of Mount Rainier National Park. These include the Mount Rainier National Park home page (<http://www.nps.gov/mora>) and bibliography (<http://www1.nature.nps.gov/nrbib/index.htm>). The following are some of the other resources that were used in the preparation of this chapter:

*Flora of Mount Rainier National Park*  
(Brockman 1947)

*The Geologic Story of Mount Rainier*  
(USGS 1969a)

*Surficial Geology of Mount Rainier National Park* (USGS 1969b)

*A Visitor's Guide to Mount Rainier Glaciers* (Driedger 1986)

*The Forest Communities of Mount Rainier National Park* (Franklin et al. 1988)

*The Forests of Mount Rainier* (Moir 1989)

*Wilderness Management Plan* (NPS 1992c)

*National Historic Landmark Nomination, Mount Rainier National Park* (NPS 1996b)

*Landmarks in the Landscape* (Kaiser 1997)

*Wilderness by Design: Landscape, Architecture, and the National Park Service* (Carr 1998)

*Carbon River Road Reconstruction Environmental Assessment* (NPS 1998a)

*Flora of Mount Rainier National Park*  
(Biek 2000)

## IMPACT TOPICS

### RELEVANT IMPACT TOPICS

The Council on Environmental Quality (1978) guidelines for implementing the National Environmental Policy Act (NEPA) require that the description of the affected environment must focus on describing the resources and people that may be affected by the alternatives. Impact topics were developed to focus the environmental analysis and to ensure that alternatives were evaluated against relevant topics. The topics, listed below, are based on public and other agency concerns identified during scoping; federal laws, regulations, and orders; and NPS *Management Policies* (NPS 1988a). A brief rationale for selecting each impact topic is provided below.

#### Natural Resources

**Air Quality.** Mount Rainier is a class I air quality area. The Clean Air Act requires federal land managers to protect park air quality related values, which include scenic, natural and cultural resources. Air quality impacts have occurred in the park due to recreational use and are a concern, as are regional effects on the park. Changes in visitor use patterns and access in the alternatives could affect the park's air quality.

**Water Resources and Water Quality.** The water resources in the park are protected and managed under the Federal Water Pollution Control Act Amendments of 1972, and the Clean Water Act of 1977. NPS *Management Policies* (NPS 1988a) also require the protection and conservation of water quality in the park. Water is an important resource in Mount Rainier. The headwaters of several drainages are in the park, including the White, Puyallup, Carbon, Mowich, and Nisqually Rivers. Any degradation of water quality would be of

concern not only to the National Park Service, but to those downstream as well.

**Floodplains.** Executive Order 11988 requires the examination of the impacts on floodplains. From an ecological perspective, the rivers and streams radiating from Mount Rainier are a key feature of Mount Rainier National Park, influencing vegetation patterns, creating and linking different habitats, and providing important wintering habitat for many species such as elk and deer. As transitional zones between upland and riparian communities, floodplains represent a diverse range of habitat types. Park development and infrastructure are focused on floodplains because they are lower in elevation, melt out from winter snow earlier, and provide level ground in steep mountain landscapes. Floodplains also pose risks to human health and safety and to park developments. Although the alternatives being considered do not propose new developments in floodplains, several existing facilities would remain in floodplain areas.

**Wetlands.** The water resources in the park, including wetlands, are protected and managed in accordance with Executive Order 11990 "Protection of Wetlands" and NPS Director's Order 77-1 and its accompanying procedural manual. This guidance further requires the examination of the impacts on wetlands.

**Soils and Vegetation.** The Organic Act and NPS *Management Policies* (NPS 1988a) both require the protection and conservation of soil and vegetation resources that could be affected by actions that would change human use and development patterns in the park.

**Wildlife.** As described for soils and vegetation, the Organic Act and NPS *Management Policies* require the protection and conservation of wildlife resources that could be affected by actions changing the human use and devel-

opment patterns in the park. The park's mammals, birds, amphibians, reptiles, and fish are important park resources, important also to visitor experiences. Any loss of wildlife habitat or decreases in wildlife populations would be of concern to park managers, visitors, and the public.

**Special Status Species.** The Endangered Species Act of 1973, as amended, requires an examination of impacts on all federally listed threatened or endangered plant and animal species. NPS *Management Policies* repeat this requirement and add the further stipulation that the analysis examine impacts on state-listed endangered, threatened, or rare species, and federal species proposed for listing. Mount Rainier supports populations of federal and state threatened or endangered species, species proposed for federal listing, species of concern, state sensitive species, and state candidates for listing.

### Geologic Hazards

Public health and safety is of major importance to park managers. NPS *Management Policies* (NPS 1988a) state that "the National Park Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees." However, Mount Rainier is an active volcano that presents considerable hazards to park visitors, employees, and infrastructure. The primary geologic hazard is from debris flows. Many of the park's developed sites are located on debris flow deposits in valley bottoms, and 7 of 23 developed sites in the park are in a debris flow hazard zone with an estimated recurrence interval of less than 100 years (Scott et al. 1992; Hoblitt et al. 1995). Other potential hazards are pyroclastic flows, ash fall, and lava flows (if Mount Rainier erupts), as well as snow avalanches, rock falls, and landslides.

### Cultural Resources

Under the requirements of section 106 of the National Historic Preservation Act, the Organic Act, NPS *Management Policies*, and other relevant cultural resources regulations and policies, the National Park Service is required to consider the effects of its undertakings on historic properties and cultural resources, and to carry out appropriate measures for their protection and preservation, particularly in adherence to the *Secretary of Interior's Standards for the Treatment of Historic Properties*.

**Archeological Resources.** The Archeological Resources Protection Act and the National Historic Preservation Act require the evaluation and documentation of effects on archeological resources. Ground disturbance associated with development undertakings could disturb unknown archeological resources in project areas. Archeological resources are therefore considered a relevant impact topic.

**Ethnographic Resources.** Mount Rainier holds special sacred significance for a number of regional Native American tribes, and issues regarding tribal access for cultural and religious purposes have been the subject of park/tribal agreements. Ethnographic resources are therefore addressed.

**Historic Resources, Including the National Historic Landmark District.** Actions considered under the alternatives have the potential to affect historic properties and various features of the cultural landscape identified as contributing to the significance of the park's National Historic Landmark District or historic buildings and structures. Of particular concern are the effects on historic patterns of circulation and use, and the historic character of roadside landscapes and developed areas.

**The Henry M. Jackson Memorial Visitor Center.** This is the park's primary visitor center. Although the visitor center does not

contribute to the National Historic Landmark District, it potentially meets the eligibility criteria for listing on the National Register of Historic Places. Therefore, any actions in the alternatives that would have the potential to affect this property would be of concern and would be a relevant impact topic.

### **Visitor Experience**

This impact topic relates to the quality of the visitor experience, which is significant to park managers and visitors. One of the purposes of Mount Rainier is to provide for public enjoyment. During the scoping period the public expressed concern about crowding and congestion, access to different parts of the park, and the adequacy of interpretive services. The alternative actions and proposed management zones could affect many visitors' experiences in the park, particularly in the most popular areas such as Paradise and Sunrise.

**Access and Transportation Facilities and Services.** Actions in the alternatives that would change the amount of traffic, alter parking or shuttle services, affect access to different parts of the park, or change distribution patterns throughout the park have the potential to improve or detract from the quality of the visitor experience. These actions would be of interest to visitors, park managers, and the public.

**Range and Enjoyment of Activities.** This topic looks at how the range of activities available to visitors and the quality of the visitor enjoyment would change as a result of implementing the alternatives. Changes in available visitor opportunities, as well as factors that affect visitors' enjoyment of activities, would determine what a visitor would experience. The alternatives would also change the character of the visitor experience by changing the number of vehicles that visitors would encounter on park roads and at activity areas, especially on sunny summer weekends. Reductions in the presence of

vehicles would improve the visitor experience by removing an element which conflicts with the wilderness and scenic values of the park.

### **Convenience and Accessibility of**

**Information.** The management alternatives would also affect what people do while they are in the park. The availability and convenience of information/interpretive facilities outside the park and in the park are an important consideration in the quality of the overall visitor experience. Providing visitors with more information, improved park orientation, and greater interpretive opportunities to learn about the park and its resources can considerably improve the visitor experience.

**Wilderness Experience.** One of the purposes of Mount Rainier National Park is to ensure that wilderness values are maintained and protected. With 97% of Mount Rainier designated as wilderness, these values are key to many visitors' experiences and to the management of the park. Any decreases in opportunities for solitude, the apparent naturalness of the park, and other wilderness values would be of concern to park managers, visitors, and the public. During the scoping period the public expressed concerns regarding impacts on resources and visitor experiences as a result of increasing visitation in the wilderness area. The alternatives could result in changes in uses, use levels, patterns, and visitor distribution in the nonwilderness, which in turn could affect wilderness values. The new management zones also could affect wilderness values.

### **Socioeconomic Environment**

Mount Rainier National Park affects land uses adjacent to the park, the economy of local gateway communities, and recreational opportunities on adjacent lands. Local residents and others are concerned about changes in the management of Mount Rainier affecting their lives and socioeconomic environment.

**Regional Context.** The effect of changes in overall economic activity related to the park, such as employment, tourism expenditures and local procurement for park construction and operations would affect, to some degree, the economy of the region surrounding the park. At the same time, the overall change in economic activity and population growth in the region would affect the potential number of recreational visitors to the park.

**Regional Recreational Opportunities.**

Actions in the alternatives could affect visitor use in other nearby recreational areas. In particular, implementing a carrying capacity framework could displace some visitors, who might decide to visit other areas in the region. Depending on the number of people who were displaced from the park, the visitor experiences offered in these areas and management of the areas could be affected.

**Gateway Communities.** The gateway communities would be directly and indirectly affected by actions taken in the park. As noted above, changes in visitation levels and patterns have the potential to affect the future of these communities. Proposed developments in and outside the park also could affect the local communities.

**Concessions.** Actions proposed in the alternatives could adversely or beneficially affect the park's concessioners. For example, establishing carrying capacity, requiring concession guests to take shuttles into the park, and changing parking spaces could all affect concessioners. This in turn could affect the experience of clients and other visitors in the park.

**IMPACT TOPICS CONSIDERED  
BUT NOT ANALYZED IN DETAIL**

Several potential impact topics were dismissed because they would not be affected, or the potential for impacts under all of the alternatives would be negligible. These topics are

mentioned below, with an explanation of why they were not considered in detail.

**Conformity with Local Land Use Plans**

The basic land use of the park as a public recreation and wilderness management area is in conformance with local land use plans, and because the proposed management zones would not change these basic uses, there would be no conflict with local land use planning. The additional recreation opportunities in the plan, including added campground and picnic sites and encouraging expanded winter recreation (skiing, snowshoeing, and snowboarding) are also consistent with the basic land uses in the park and local land use plans. Therefore, there is no need to analyze conformity with local land use plans in more detail.

**Prime and Unique Agricultural Lands**

Even though soil surveys have not been conducted in Mount Rainier National Park, no unique agricultural soils are believed to exist in the park (Natsuhara 2000). Based on a soil survey outside the park, three soil map units that border the park are considered prime farmland if they are irrigated. Although these soils may be present in the park along several drainages at lower elevations, no irrigation systems are in place, which is a condition for these soils to be considered prime farmland. Because irrigation systems do not exist in the park and there is little likelihood of such systems being installed, impacts on prime farmlands need not be considered in more detail. (Natsuhara 2000). In addition, it is expected that none of these soils would be impacted by the construction of NPS facilities.

**Natural or Depletable Resource  
Requirements and Conservation Potential**

None of the alternatives being considered would result in the extraction of resources

from the park. Under all of the alternatives ecological principles would be applied to ensure that the park's natural resources were maintained and not impaired.

### **Environmental Justice**

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

For the purpose of fulfilling Executive Order 12898, in the context of the National Environmental Policy Act, the alternatives addressed in this plan were assessed during the planning process. It was determined that none of these alternatives would result in significant direct or indirect adverse effects on any minority or low-income population or community. The following information contributed to this conclusion:

- The developments and actions in the alternatives would not result in any identifiable human health effects. Therefore, there would be no direct or indirect effects on human health within any minority or low-income population or community.
- The impacts on the natural and physical environment that would occur due to any of the alternatives would not significantly and adversely affect any minority or low-income population or community, or be specific to such populations or communities.
- The alternatives would not result in any identified effects that would be specific to any minority or low-income community.

- The Mount Rainier planning team actively solicited public participation as part of the planning process and has given equal consideration to input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- The park staff has consulted and worked with the affected Native American tribes in cooperative efforts to manage the recreational potential of the park and its resources effectively and will continue to do so. No adverse effects were identified that disproportionately affect the tribes.
- Impacts on the socioeconomic environment due to the alternatives would be minor or positive and would occur mostly in the geographic area near the park. These impacts would not occur at one time but over a number of years, mitigating their effects. Such impacts would not be expected to substantially alter the physical and social structure of nearby communities.

### **Special Status Species That Do Not Occur in the Park**

Listings of federally-listed species occurring in Pierce and Lewis Counties provided by the U.S. Fish and Wildlife included several species that were subsequently determined not to occur in Mount Rainier National Park. These species are Oregon vesper sparrow (*Contopus cooperi*), western gray squirrel (*Sciurus griseus*), river lamprey (*Lampetra ayresi*), pacific lamprey (*Entosphenus tridentata*), Columbia torrent salamander, and Kincaid's lupine (*Lupinus sulphureus kincaidii*). Because these species are known not to occur in the park, they were not considered in the analysis of impacts on special status species.

## NATURAL RESOURCES

### AIR QUALITY

Mount Rainier National Park is in a mandatory class I air quality area, as defined in the Clean Air Act of 1977. A class I designation allows very little additional deterioration of air quality. Some of the adjacent U.S. Forest Service wilderness areas (e.g., Goat Rocks Wilderness and Alpine Lakes Wilderness) are also designated as class I areas.

In the past several sources inside Mount Rainier National Park contributed to air pollution in the park. Eliminating fireplaces in most park structures and eliminating wilderness campfires have helped improve the park's air quality from its historic levels. However, numerous sources in the region now affect the park's air quality to a much greater degree (see below).

The air quality in the park varies from excellent to poor, depending on the pollutants being measured, the location in the park, the season and time of day, the direction the wind is blowing, and other factors. The pollutants of most concern to park air quality are fine particulates, sulfates, and ozone.

The annual average visibility levels at Mount Rainier are about 55 kilometers, which is less than the typical 130 kilometers in the Colorado Plateau and the central Rocky Mountains, but greater than the 20 to 30 kilometers typical of many eastern sites. Visibility conditions at Mount Rainier National Park are degraded by concentrations of fine particulates. On the average, about 53% of the visibility reduction is caused by sulfate fine particulates, 19% by organic fine particulates, and 15% by soot fine particulates. Visibility at the park is among the worst of the class I areas in the western United States.

Monitoring of sulfates and nitrates, precursors to acid precipitation, at La Grande (25 kilometers west of Mount Rainier), has shown sulfate ion concentrations in precipitation greater than that observed at most other parks in the Pacific Northwest. The chemistry of cloud water samples taken at Paradise has shown some of the lowest pH levels (down to pH 3.2) and highest levels of acidity of any taken in the state (U.S. EPA 1999). Data from Tahoma Woods and Paradise also show higher levels of sulfates and increasing levels of nitrates.

Elevated ozone levels (above 80 parts per billion) have also been recorded in and near the park, including Longmire (during the summers of 1987 and 1988), Carbon River (during 1989 to 1992), and Tahoma Woods and Paradise. Monitoring conducted in 1995–1996 showed higher levels of ozone at higher elevations, suggesting that plant species at higher elevations may be at risk to ozone-induced damage. The annual maximum 1-hour ozone levels at Mount Rainier (80–110 parts per billion) are about 20–30 parts per billion higher than those typically measured at the other NPS monitoring sites in North Cascades and Olympic National Parks.

Mount Rainier's peak ozone levels are comparable to those measured at other NPS units in the Colorado Plateau but are significantly lower than ozone concentrations measured in NPS units in southern California, the Northeast, and the east-central United States. The ozone levels measured at the park also are well below the new U.S. Environmental Protection Agency (EPA) 8-hour average ozone standard, which is designed to protect human health.

Within Mount Rainier, the primary human sources of air pollutants are motor vehicles, generators, heating systems, the few remaining wood stoves in park buildings, and campfire

smoke. Campfire smoke during summer can degrade local air quality, especially near park campgrounds at Ohanapecosh, Cougar Rock, White River, and Sunshine Point. Air quality degradation can also occur when there are long backups of traffic at the park entrances and idling cars or tour buses in parking lots of popular areas.

Most of Mount Rainier's air pollution is due to external stationary and mobile sources in the Puget Sound region. The park is surrounded by King, Pierce, Lewis and Yakima Counties, all of which the Environmental Protection Agency has designated as nonattainment areas (moderate) for particulate matter. Particulate matter includes dust, dirt, soot, smoke, and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural wind-blown dust. Particulates formed in the atmosphere by condensation or the transformation of emitted gases such as sulfur dioxide and volatile organic carbons are also considered particulate matter.

Several studies undertaken by the National Park Service and others have shown that sulfur dioxide emissions from the Centralia Power Plant, located in Centralia, Washington, contribute significantly to reductions in visibility and acid deposition in Mount Rainier National Park. The park is approximately 80 kilometers northeast and downwind of the Centralia plant — the largest single point source for sulfur emissions in Washington State and the western United States.

Other sources of pollutants that affect the park are urban transportation in the Seattle-Tacoma area, industrial facilities north of the park, and area lumber, pulp, and paper mills. Slash burning associated with logging on private, state, and national forest lands also contributes to additional emissions of fine particulates in the area. Wildfires in the park or region can add large quantities of particulates, carbon monoxide, volatile organic compounds, and

other pollutants in the area. Emissions or organic compounds from trees also contribute a minor amount to visibility degradation.

## **WATER RESOURCES AND WATER QUALITY**

Water is integral to all park ecosystems. Park water resources are diverse — alpine lakes, waterfalls, glacially fed rivers, and mineral springs. The streams and rivers of Mount Rainier National Park, which have been altered very little by humans, represent outstanding examples of the original pristine aquatic ecosystems of North America. Their unique characteristics make them valuable recreational resources; in addition, these rivers and streams may serve as benchmarks for identifying changes in area environmental conditions and natural resources. The history of natural disturbance and the complex mosaics of riverine landforms have strongly shaped the development and composition of stream ecosystems emerging from the slopes of Mount Rainier.

Both glacial and nonglacial drainages originate on the slopes of Mount Rainier. The mountain has 26 major glaciers, covering 35 square miles — the largest single mountain glacial system in the 48 contiguous states. For the purposes of managing water resources of the park, nine major watersheds have been delineated. With the exception of Huckleberry Creek and a portion of the Ohanapecosh River, the rivers and streams within the park boundary originate from glacial meltwater. Drainage area ranges from 13,300 acres in the Puyallup watershed to 41,400 acres in the Ohanapecosh drainage.

With some exceptions (including the northern watershed of the Carbon River, southern watershed of the Nisqually River, Berry Creek, and some tributaries to Chenuis Creek) all rivers and streams within the park boundary originate inside the boundary. Approximately 470 rivers and streams within Mount Rainier

National Park are shown on U.S. Geological Survey 7.5 minute quadrangles (scale 1:24,000); 383 are perennial and 84 are intermittent. Mineral geothermal springs are found on the summit of Mount Rainier, at Longmire, and at Ohanapecosh. Cold springs also occur throughout the park.

A total of 405 lakes are shown within the park on U.S. Geological Survey 7.5 minute quadrangles. Of these, 310 are permanent lakes, and the rest are intermittent. At approximately 123 acres and 57 feet deep, the exceptionally clear Mowich Lake is the largest and deepest lake in the park.

The absence of baseline information on the physical, chemical, and biological characteristics of park surface and groundwater makes it difficult to detect water quality changes; however, because most of the park's streams originate in the park, sources of contamination are limited, and the quality of most surface waters is thought to be generally good.

The following threats to the park's water resources have been identified:

- vehicle use and stormwater runoff from roads and parking lots
- visitor use impacts (e.g., potential changes to water quality of lakes and rivers from human waste and sedimentation of shorelines)
- atmospheric input from human sources (anthropogenic) sources (e.g., acid precipitation)
- the failure of park infrastructure (sewerline breaks, storage tank leaks) routine park operations (such as sewage "bypass" occasions, hazardous material spills during routine servicing of fuel tanks)

Stormwater and snowmelt runoff from roads and parking lots may be affecting the quality

of adjacent waters. Several park roads are adjacent to streams, rivers, and lakes and are within their watersheds. Such roads include the Stevens Canyon road adjacent to Reflection Lake and Lake Louise, State Route 410 adjacent to Tipsoo Lake, and the Mowich Lake road, which descends adjacent to Mowich Lake. The large parking areas at Sunrise, Paradise, and Longmire are used extensively during summer, and those at Longmire and Paradise are used year-round. During rainfall events a sheen of oil can be seen on water flowing into storm drains in these lots.

The destination of outflow from all storm drains has not been determined; however, most park storm drains do not receive treatment via existing sewer systems. Although runoff may be a temporary event and dilution may lessen the effects, heavy rainfall could result in periodic shocks or "pulses" of contaminants into park surface waters. The stormwater runoff may contain heavy metals, petroleum derivatives (including hydrocarbons), ammonia, suspended solids, rubber, zinc, lead, copper, nickel, chromium, additional nutrients and coliform bacteria. These may be affecting the park's water quality to an unknown degree.

In general, the higher the percentage of impervious area, the higher the volume of runoff is into adjacent areas. This runoff may be transported to nearby streams and lakes or may infiltrate to shallow groundwater. Increased runoff may also cause stream bank or shoreline loss and may result in damage or destruction of wildlife habitat.

A comparison of data for Mowich Lake from a 1967 limnological study with 1988–94 data indicates that the maximum clarity of the lake appears to have been reduced by about 15%–25%. Primary production appears to have increased slightly, and chlorophyll concentrations at the bottom of the clear lake appear to have increased as well. Deposits of dust and runoff from the adjacent unpaved access road

are thought likely to be affecting the lake water (NPS 1995a; NPS 1998b).

Nutrient loading indicates that at current use levels, human wastes are contributing minimally to the enrichment of lakes in the park and that some lakes are particularly sensitive. Preliminary sampling at two sites below Camp Muir in 1994 showed elevated levels of nitrate-nitrite, ammonia nitrogen, and Kjeldahl nitrogen (NPS 1995a). *Giardia lamblia* cysts and other evidence of water contamination have been documented throughout the wilderness (NPS 1986). The park has been conducting a high altitude waste removal/blue bag program since 1984 to help reduce this contamination.

Acid deposition may be affecting the park's waters to an unknown degree. Many lakes in the park and other high mountain lakes in the surrounding Cascade Mountains have low acidic buffering capacity. Streams are similarly susceptible when flowing over granitic substrate through small drainage basins. Geology, soil, and vegetation types in many parts of the park present the "ingredients" for susceptibility to acidic precipitation. Of the park lakes that have been inventoried, 29% have been identified as being extremely sensitive to acid deposition (NPS 1999c).

## FLOODPLAINS

The rivers and streams radiating from Mount Rainier are a significant feature linking the park's glaciers with the Puget Sound region and other marine ecosystems. In addition to serving as a source of fresh water for urban areas far downstream, the rivers are important wildlife habitat and influence area vegetation patterns by flooding and channel shifts. Floodplains provide important wintering habitat for many wildlife species. As transition zones between upland and riparian communities, floodplains contain a diverse range of habitat types. The value of floodplains is

recognized by NPS *Management Policies* and other legislation.

## Floodplain Processes

Floodplain processes at Mount Rainier are dynamic and complex. The rivers draining Mount Rainier are steep-gradient rivers that radiate outward from the Mount Rainier volcano and that carry vast amounts of water, sand, gravel, and boulders. Because of the sediment and debris they carry downstream, the banks and floodplains of these rivers are extremely unstable, as evidenced by their braided channel pattern and eroding banks. Deposition of glacial sediments by floods and debris flows is the primary cause of stream channel instability in valleys throughout the park. Because of this instability, the 100-year and 500-year floodplains associated with Mount Rainier rivers are not static, but continue to evolve and change.

Channel deposition in three rivers was investigated to determine how unstable riverbeds are and to determine how long typical floodplain assessments are accurate in areas throughout the park. The three rivers evaluated were White River, Tahoma Creek, and Nisqually River. On the White River in the early 1960s, net stream deposition in a reach 1.5 miles below Emmons Glacier was found to be 1.08 feet in 3 years (Fahnestock 1963). The bed of Tahoma Creek between river miles 3 and 6 deposited 6.6 feet in 6 years, following increased glacial outburst activity from South Tahoma Glacier (Walder and Driedger 1993). Data on the Nisqually River at Longmire indicated deposition was approximately 3 to 4 feet in 12 years at three closely located cross sections of the river (Nelson 1986; NPS 1994a). Measured and estimated rates of deposition from these three sites ranged from near 0.5 to more than 1 foot per year.

Floods can occur in the park any time throughout the year and can be triggered by a number

of events, including glacial outbursts, precipitation, enhanced melting of snow and ice, and volcanic activity. Precipitation-induced flooding and debris flows are extremes on a continuum of hydrologic/ geologic events.

Precipitation-induced flooding typically occurs twice a year on rivers at Mount Rainier. The largest and most frequent floods occur during late fall and early winter, when heavy rainfall melts snow at high elevations. These floods have high peak flows and continue to damage both the Carbon River Road and Westside Road. Spring floods occur in April and May with rapid melting of snow. These floods typically have smaller peak flows, but are of longer duration than the fall and winter floods.

Floods from melted glacial ice (meltwater) occur primarily during the summer and fall. This type of flooding on streams draining the large glaciers is highest during late July and August. Glacial meltwater streams also experience daily cycles of discharge that are an afternoon hazard for hikers.

Floods from glacial outbursts are a special type of flood caused by a massive, sudden release of water from a glacier and are known to occur on either sunny or rainy days in summer or fall (Walder and Driedger 1993). Tahoma Creek is experiencing outburst floods from South Tahoma Glacier. Nisqually Glacier frequently produced outburst floods in the 1950s and 1960s, but has not produced one since 1990.

Extreme floods are known to trigger debris flows (or lahars) that are composed of water, ice, sediment, and other debris in the rivers and streams that flank the volcano. Debris flows can begin as outburst floods from glaciers, then transform into sediment-dominated flows as they move down the steep, debris-choked valleys. In general, debris flows occur less frequently, but are far more destructive than water-dominated floods. Debris flows are discussed further under “Geologic Hazards.”

## Floodplain Management

Floodplain studies for many of the developed sites at Mount Rainier National Park were conducted to categorize development according to the *Floodplain Management Guideline* (NPS 1993b). The objectives of the *Floodplain Management Guideline* and its subsequent revisions are to avoid adverse impacts from occupancy and modification of floodplains, and to avoid development in floodplains wherever there is a workable alternative. This is to ensure the safety of visitors and employees and to protect important park resources from the direct and indirect effects of flooding.

The results of the floodplain studies (shown in table 9) indicated that 10 development sites are exempt from the guideline. Actions that are exempt from this guideline (“excepted actions”) are the park functions that may be located near streams and rivers for the enjoyment of visitors but that do not involve overnight occupation. Entrance stations, access routes, and internal roads and picnic facilities, campgrounds, and day-use facilities are generally considered excepted actions.

To determine whether facilities or developments might be in the floodplain, preliminary floodplain assessments were conducted at the remaining 13 developed sites with overnight housing and sensitive facilities. The results of these studies indicated that 9 of these 13 sites were outside their regulatory floodplains (a 100- or 500-year floodplain, depending on the functions of facilities at the site). Two sites, the Carbon River entrance and the Ipsut Creek campground, appeared to be within the regulatory floodplain. The Longmire complex and Sunshine Point campground also appeared to be within a floodplain, but further studies indicated that they are outside the regulatory floodplain, although prone to outburst flooding. Floodplain issues surrounding Longmire, the Sunshine Point campground, the Carbon

**TABLE 9: PRELIMINARY CLASSIFICATION OF DEVELOPMENT SITES  
ACCORDING TO THE FLOODPLAIN MANAGEMENT GUIDELINE (NPS 1993B)**

<b>Excepted Actions</b>	<b>Outside Regulatory Floodplain</b>	<b>Inside Regulatory Floodplain</b>
Box Canyon overlook	Cougar Rock camp tender house	Carbon River entrance facilities
Box Canyon picnic area	Longmire complex	Ipsut Creek campground
Camp Muir	Mowich Lake campground	Longmire complex levee <sup>a/</sup>
Camp Schurman	Nisqually entrance housing	Sunshine Point campground levee <sup>a/</sup>
Chinook Pass picnic area	Ohanapecosh housing	
Falls Creek picnic area	Paradise	
Grove of the Patriarchs	Sunrise	
Kautz Creek	Sunshine Point campground	
Narada Falls overlook	Tahoma Woods housing	
Stevens Canyon entrance	White River entrance and housing	
	White River tender house	

River entrance, and the Ipsut Creek campground are discussed below.

**Longmire.** The Longmire compound, including housing and administrative facilities and fuel storage sites, is built on a debris flow terrace approximately 10 feet above the Nisqually River floodplain. Past studies placed this facility outside the 500-year floodplain of the Nisqually River (Nelson 1986). However, a 1959 flood that inundated the compound brought this study into question.

The National Park Service performed hydraulic modeling in 1994 to estimate the 100-year and 500-year floodplain boundaries for a precipitation-induced flood event and the boundaries for a 500-year outburst flood along the Nisqually River near Longmire (NPS 1997b). The discharge associated with a 500-year outburst flood was evaluated because the discharge would be substantially larger than the discharge associated with a rain-related flood (32,000 cubic feet per second versus 5,200 cubic feet per second).

The output from the model indicated that 100-year and 500-year precipitation floods would be contained within the channel of the Nisqually River and would not flood the Longmire

compound. However, the velocities would be fast enough to cause severe erosion along unvegetated channel banks, such as the levee constructed to protect the compound.

Model output further indicated that flood flows from a 500-year outburst flood would exceed the channel capacity and flood the Longmire compound. Based on these results, the flood in 1959 was most likely a small debris flow that may have started as an outburst flood from the Nisqually Glacier rather than a precipitation-induced event. Sediment deposition in the Nisqually River where the river exits a canyon near Longmire most likely caused floodwater to be diverted into the compound.

**Sunshine Point Campground.** Like Longmire, the Sunshine Point campground is outside the regulatory floodplain for precipitation-related events, and like Longmire, was affected by prior flooding along the Nisqually River as a result of outburst flood activity from the Nisqually Glacier. Because outburst flooding from the glacier has decreased over the past few decades, the probability that this site would flood from such an event is small. However, like Longmire, continued sediment deposition in the Nisqually River channel could cause higher flood elevations and require

continued maintenance within the regulatory floodplain to avoid erosion of the levees protecting the campground.

**Ipsut Creek Campground.** A preliminary floodplain assessment in 1994 determined that the campground is in a high flood hazard area adjacent to the floodplain of the Carbon River (NPS 1997b). The many channels that form the large braided channel network in this area shift constantly. Numerous modern and old flood channels crisscross the floodplain. Flood flow through the channels is shallow, but rapid. Depths of flow for the 50-year and 100-year floods in the main channel of the Carbon River are only 3.5 feet, but velocities are estimated at 8 feet per second.

A detailed floodplain study conducted after the 1994 assessment indicated that parts of the campground, former walk-in sites, and the entrance road occupy very low parts of the floodplain. Most of the campground rests on a low terrace, 5 to 6 feet above the modern or current channel. The walk-in sites were isolated by swift water in a side channel during even small flood events. As a result, these sites were permanently closed in 1997. High flood hazard occurs in this area with discharges of 1,000 cubic feet per second or greater.

Hydraulic model output indicated that most of the campground is outside the existing 100-year floodplain. However, the unstable nature of braided channels and the location of parts of the campground at lower elevations than the active river channel suggest that the 100-year floodplain boundaries from the model may not be accurate for very long. Therefore, the 100-year floodplain boundaries have been located to include the low-elevation channels on the southwest end of the valley and to include the campground.

Over the next few decades it is anticipated that continued deposition in the modern channel and upstream channel alignment would cause the Carbon River to shift to the south, isolating

and claiming all or parts of the campground, and causing considerable damage to roads, trails, and other facilities.

**Carbon River Entrance.** An entrance station, a ranger station, and a housing and administrative area are located in the vicinity of the Carbon River entrance. The entrance station is categorized as an excepted action under the Floodplain Management Guideline because its function depends on a road that is intermittently in the floodplain. The ranger station and the housing and administrative area are not excepted actions.

Initial floodplain studies performed in 1994 suggested that the entrance and housing facilities were within the 100-year floodplain (as noted in table 9). Detailed floodplain assessments performed in 1996 using hydraulic models indicated that all the facilities are outside the 100-year regulatory floodplain. Historic flooding observed at the entrance station probably was caused by a shift in the channel of June Creek (a tributary to the Carbon River) to the west of the entrance area. (This apparently occurred since the publication of the U.S. Geological Survey 7.5 minute map in 1971.) Flooding that does occur at the entrance involves less than 2 feet of standing water and very low velocities.

However, there is other evidence that the facilities are within the floodplain. The presence of floodplain soils, a levee, and an apparent absence of volcanic tephra (clastic material ejected from a volcano) suggest that larger floods might have occasionally inundated this site in the recent past. Thus, although the hydraulic model suggests otherwise, because of the erosion of soils and the potential for floods to inundate the site, the entrance facilities are within the regulatory floodplain (J. Riedel, NPS geologist, pers. com., July 10, 2001).

Channel changes in the next few decades also could threaten these facilities through bank

erosion. Such channel changes, a common feature of park rivers, have resulted in the migration of the Carbon River from its north bank to its south bank over the past few years. For this reason the road, which is below the river in some places, has been flooded more often with smaller flood discharges.

## WETLANDS

Wetlands are areas that are inundated or saturated by surface or ground water often enough and long enough to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Most park wetlands were identified based on the *National Wetlands Inventory* maps (USFWS 1984) and a parkwide wetlands survey (NPS 2000c). The techniques in the *Wetlands Delineation Manual* (U.S. Army Corps of Engineers 1987) also were used to ensure compliance with section 404 of the Clean Water Act, which is administered by the Army Corps of Engineers.

The wetland assessments indicated that there are at least 2,500 wetlands in the park. These maps document more than 2,000 acres of palustrine (typically called marshes, swamps, and bogs) and deepwater wetlands, and riverine wetlands along approximately 225 miles of rivers and streams.

Wetlands in the park exhibit a wide diversity of shapes, sizes, and depths and can be permanently to temporarily flooded. The bottom type of wetlands in the park is usually open water, unconsolidated shore, streambed, aquatic bed, forested, emergent, or shrub/scrub vegetation.

The park's wetlands are found in the forest, subalpine, and alpine environments.

- Concentrations of wetlands can be found in subalpine parklands such as Spray Park, Elysian Fields, Mazama Ridge, and Mirror Lakes.

- Forested regions with large numbers of wetlands include Golden Lakes, Reflection Lakes, and Marsh Lakes.
- Nonwilderness areas with large numbers of wetlands are Westside Road, Paradise, Sunrise, Carbon River Road, and Mowich Lake Road.

## SOILS AND VEGETATION

### Soils

Few studies have assessed park soils. The best soils information available for Mount Rainier National Park is a general description of a classification system for forest soils that was completed as a master's thesis (Hobson 1976) and some soil texture data from restoration sites. No systematic soil mapping has been conducted in the park.

The higher elevations of Mount Rainier are generally composed of solid rock and talus slopes with virtually no topsoil. The lower elevations are composed of glacial till. The valley bottoms contain layers of mixed rocks with some benches of silt in flatter areas, all of which were deposited by streams and glaciers. The subalpine meadows have very shallow, loose, friable soils and are easily eroded by foot and horse traffic.

Hobson (1976) developed a classification system for forest soils based on the geological origin, relief, and drainage features of the park. According to this classification system, the four most common soil groups in the park's forested areas are as follows:

- Tephra soils are pyroclastic deposits identified by individual ash layers. These soils are the result of volcanic eruptions of Mount Rainier, Mount St. Helens, and to a lesser extent, Mount Mazama. Although pumice deposits in the park are thin, the soil they form supports the subalpine and

alpine meadows that many visitors come to enjoy.

- Colluvial soils are unstable soils that are rapidly drained and consist of coarse, unconsolidated, mixed parent materials. These soils are generally found on slopes at all elevations, but especially steep slopes and south-facing aspects.
- Alluvial soils are soils that formed from river deposition, glacial outburst floods, and ephemeral streams carrying snowmelt discharge from upper shores. These soils are often found in major river valleys, along streams, on wet benches where fine-textured water-deposited materials are often mixed or interbedded with tephra, and on alluvial slopes and fans.
- Mudflow soils are surface or subsurface parent materials within the rooting zone that are the result of lahars (volcanic mudflows). These soils may also contain tephra W (a volcanic ash layer from a Mount St. Helens eruption) or alluvial or colluvial surface deposits.

Cryptobiotic soil crusts are the foundation of high-elevation ecosystems. It has been shown that these crusts act to bind soil particles together, thus increasing soil stability. In the alpine ecosystems of Mount Rainier, cryptobiotic cover appears to be associated with the establishment of heather communities and some fellfield vegetation. Although preliminary research has documented the correlation with soil crusts, no research has been conducted to identify species compositions, to correlate cover with environmental conditions, or to quantify their occurrence at a landscape level.

In desert and tundra ecosystems, crusts have been shown to increase rainfall infiltration, reduce sediment production and runoff, and facilitate the establishment of vascular plants by enhancing nutrient and water availability

for these plants. Arid lands research indicates that visitor trampling of cryptobiotic soils can significantly decrease nutrient cycling and alter successional patterns.

### Native Vegetation

Climatic, topographic, and soil conditions combine to give Mount Rainier some of the most diverse vegetation in the Cascade Mountains. Different vegetative communities are present at different elevations in the park, ranging from temperate rainforest to alpine tundra.

Forests cover approximately 58% of the park. Low-elevation forests are distributed from the park's boundary at 1,700 feet to about 2,700 feet elevation and are dominated by western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), and western red cedar (*Thuja plicata*). Mid-elevation forests extend from 2,500 feet to 5,000 feet elevation and contain Pacific silver fir (*Abies amabilis*), Alaska yellow cedar (*Chamaecyparis nootkensis*), western white pine (*Pinus monticola*), and noble fir (*Abies procera*).

Above 4,500 feet, trees become less dense as the forest grades into subalpine parkland. Higher elevation forests are dominated by mountain hemlock (*Tsuga mertensiana*), subalpine fir (*Abies lasiocarpa*), Alaska yellow cedar and Pacific silver fir. Forest ages range from young stands (less than 100 years old) invading on moraines left by receding glaciers and on burned areas to old-growth stands (1,000 or more years old). Stands older than 1,000 years exist along State Route 123, the Stevens Canyon road, in Cougar Rock campground, and in the area between Ipsut Creek and Mowich Lake (BRW Inc. 1994).

Subalpine parkland covers approximately 23% of the park; vegetation in this zone is a mosaic of tree clumps and herbaceous meadows extending from 5,000 feet to about 7,000 feet

elevation. The depth and duration of the snow-pack limits tree cover in subalpine meadows. Meadow vegetation can be categorized in five broad vegetation types (Henderson 1974): (1) heath shrub, dominated by ericaceous species such as heather and huckleberry; (2) lush herbaceous vegetation dominated by tall perennials, including Sitka valerian, subalpine lupine, and green hellebore; (3) low herbaceous vegetation dominated by fanleaf cinquefoil and pussytoes, often with lesser amounts of black sedge; (4) wet sedge in low, wet areas dominated by sedges and sometimes with alpine aster and pussytoes; (5) and dry grass, found on well-drained sites common on the east side of the park and dominated by green fescue and subalpine lupine.

Dominant tree species in the subalpine zone are subalpine fir, mountain hemlock, and Alaska yellow cedar. Whitebark pine and Englemann spruce are present on drier sites on the east side of the park. Elsewhere, whitebark pine has been identified as a keystone species, because it has profound effects on the ecosystem that are disproportionately great in relationship to its abundance.

The alpine zone extends from treeline to the mountain's summit. Approximately 50% of this zone is covered by permanent snow and ice and the remainder by alpine vegetation, which can be described by four broad vegetation types (Edwards 1980): fellfields, talus slopes, snowbeds, and heather communities. Talus slopes and snow beds have small, well-spaced groups of plants that are often overlooked by park visitors and casual observers. Talus slopes and ridgetops are among the first areas free of snow and thus have the longest growing season. Snow beds have the shortest growing season and may not be snow-free every year. Fellfields and heather communities have an intermediate growing season. Fellfields are areas with gentle slopes covered by small rocks and small, dispersed groups of plants such as sedges, penstemons, and asters.

The heather types are the oldest known communities in the park. Some heather communities have persisted in the park for up to 10,000 years (Edwards 1980).

Mount Rainier National Park's plant species list includes approximately 890 species of vascular plants, including nearly 40% of the region's native tree species. Over 250 species of fungi and lichens have been documented in the park.

### Exotic Plant Species

About 149 exotic (nonnative) plant species are found in the park. Most nonnative species grow in disturbed habitat below 5,500 feet. Their presence is the result of human intervention, not natural migration. About 10% of the species are aggressive, capable of invading undisturbed natural areas and dominating native plant communities. These species include: common burdock (*Arctium minus*), spotted knapweed (*Centaurea biebersteinii*), diffuse knapweed (*Centaurea diffusa*), oxeye daisy (*Chrysanthemum leucanthemum*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), tansy ragwort (*Senecio jacobea*), common tansy (*Tanacetum vulgare*), Klamath weed (*Hypericum perforatum*), Scotch broom (*Cytisus scoparius*), flat pea (*Lathyrus sylvestris*), Japanese knotweed (*Polygonum cuspidatum*), giant hogweed or giant cowparsnip (*Heraclium mategazzianum*), foxglove (*Digitalis purpurea*), orange hawkweed (*Hieracium aurantiacum*), and mullein (*Verbascum thapsus*).

Surveys of exotic species distribution were conducted in Mount Rainier National Park in 1965 and 1989 and repeated in 1998. The results of the early study indicated that most exotic species were found along roads, trails, and in developed zones. Hikers, cars, and horse use were identified as the primary means of seed dispersal. The presence of exotic species away from roads may indicate that wind or off-trail hikers are also effective vectors of exotic

plant seeds. The 1989 and 1998 surveys inventoried plots established along road edges by the earlier study. This survey documented the persistence of species over the 33-year interim, the introduction of new species, and the presence of weeds in some sites located away from roads.

### Human Impacts

The most commonly observed human impacts in the park are the loss of vegetation and soil. The most severe damage is in subalpine and alpine meadows, which are popular destinations for day hikers and cross-country campers. Damage ranges from trampled vegetation in campsites or informal (social) trails to severely eroded social or designated trails, some over 3 feet deep.

Initially, human trampling bends or breaks aboveground plant parts. Once the site becomes easily recognizable as a social trail or campsite, human use often escalates. Due to the short growing season, many plant species are unable to initiate new growth following repeated trampling, and vegetation loss quickly occurs. Continued use results in soil compaction or soil loss following the vegetation loss. Social trails on sloping hillsides may also act as channels for surface water runoff during rainy periods or during snowmelt, resulting in soil erosion.

Surveys of human impacts have been conducted since the 1960s. A parkwide human impact monitoring system was initiated in the 1970s. In 1985 a parkwide program to document quantitative measurements of social trails and campsites was also initiated.

Impacts in the Paradise Meadows were inventoried in 1986 and 1987 with the use of the social trail inventory methodology. Quantitative measurements used were the mapping of each impact on topographic maps and aerial photographs; the length, width, depth, aspect, and slope of each impact; and vegetation type.

Approximately 89% of the impacts were in the form of social trails; the remaining impacts were large bare areas used as rest stops and viewpoints. An examination of aerial photos revealed that many impacts were over 20 years old, and some were actually early trails that had been closed or relocated.

Qualitative observations addressed human impacts on wildlife, the presence of rare species, photographs, and observed use levels. Surveys completed on heavily used sites documented impacts ranging from compacted soils with minimal soil loss to social trails over 4,000 feet long and more than 3 feet deep. More than 29% of the area surveyed (maintained and social trails) contained significant or severe human impacts (compared to areas with minimal or no impacts). By 1999, only 2% of this area had been restored. The *Paradise Meadow Plan* (NPS 1989b) identifies 913 human-caused bare ground impacts, with 28.5 miles of social trail compared to 13.5 miles of maintained trails. The total surface area of all impacts was 11.8 acres, or 1.3% of the study area.

Large-scale restoration of human impacts in the Paradise Meadow was initiated in 1987. To date restoration work has been initiated on 142 impacted sites in the meadow. Of this total, 69 sites (48%) have been planted, stabilized, and filled. Active restoration (planting and seeding) has been discontinued on about half of the planted sites (32 sites) in the hope that the plants present on the site will continue to increase in cover. The sites that have not been restored are still in a bare ground condition.

Studies of human impacts have been done in the Muir corridor, above Paradise, since the late 1960s. The Muir corridor is within the currently designated Muir snowfield wilderness management zone. A total of 86 unauthorized campsites were documented in 1987 and 1988. In 1995, 21 new unauthorized campsites were inventoried, and actions were taken to begin the restoration process. Forty-

three more campsites were identified and obliterated in 1997. In most instances, the campsites had been developed on new sites and were not reestablished at former camping sites. Most campsites were found in rocky areas such as fellfields and talus slopes.

A total of 74 social trails were documented in the Muir corridor in 1987 and 1988. Social trails ranged in length from 14 feet to 1,900 feet, with an average length of 194.5 feet. The surface area of social trails ranged from 88 to 757 square feet, with a total surface area of 4,187 square feet. Most social trails meandered through all vegetation types present. In 1997 the social trails were still visible, despite vegetation restoration in campsite areas. Such impacts, although they include vegetation changes, are not limited to impacts on vegetation.

Other areas where the effects of intensive human use have led to severely eroded areas and bare ground are Spray Park, Mowich Lake, Reflection Lake, and Tipsoo Lake. Data documenting human impacts at Sunrise and Spray Park are also available. Similar data, although qualitative, rather than quantitative, are available for Mowich and Tipsoo Lakes.

## WILDLIFE

### Mammals

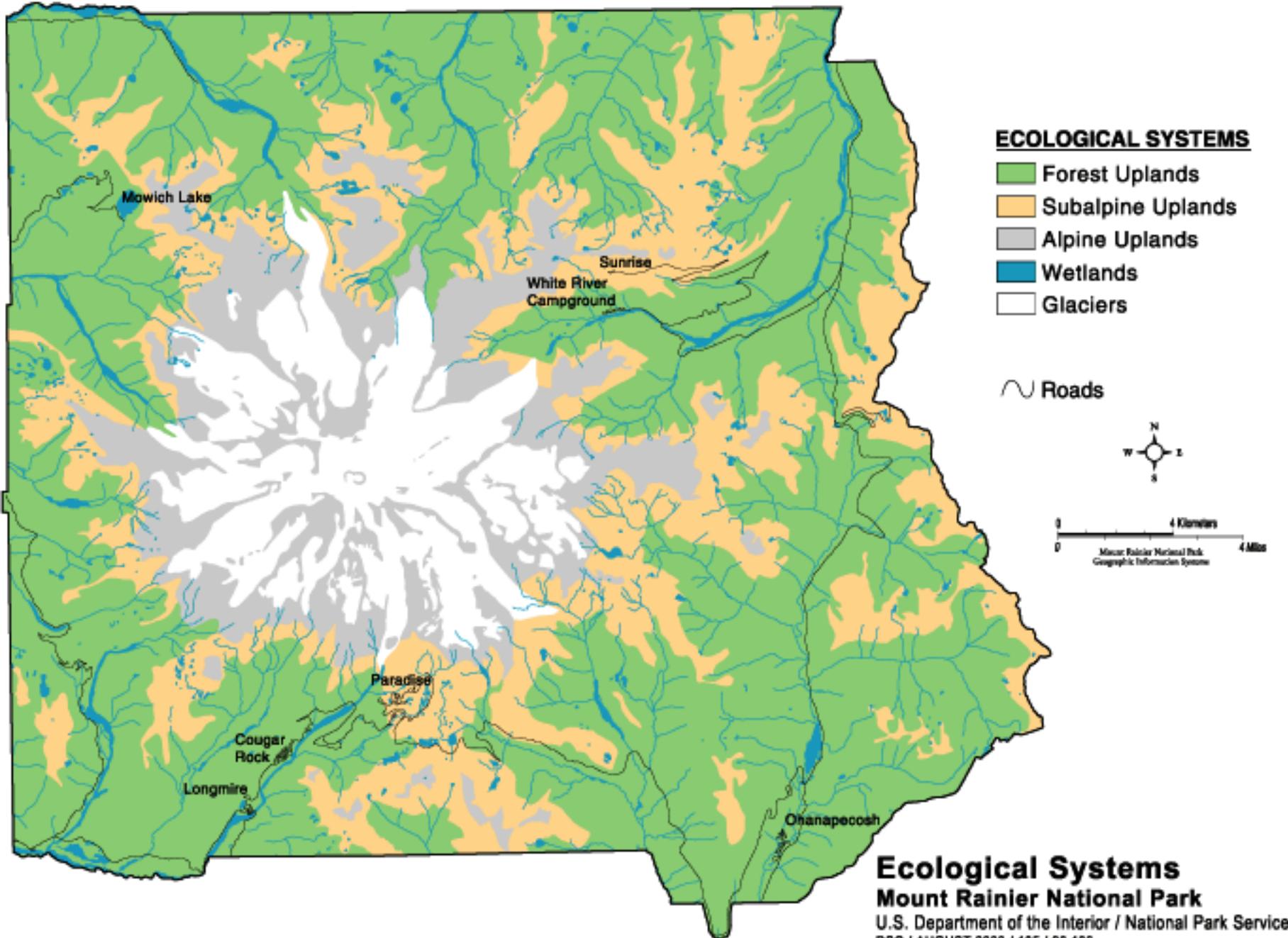
Fifty-six species of mammals are known to occur in Mount Rainier National Park, with five others that are likely but have yet to be documented. Many small mammals inhabit the park: deer mouse, Gapper red-backed vole, yellow-pine chipmunk, Townsend's chipmunk, dusky shrew, vagrant shrew, hoary marmot, pika, and snowshoe hare. Small mammals are closely intertwined with biological production in the plant communities. Changes in plant production may alter small mammal populations. In turn, small mammals may impact plant communities. Very little is known of the complex food web between small mammalian

herbivores, their plant foods, and other mammal and bird species that depend on them for food. A change in small mammal populations often leads to a fluctuation in the abundance of another species.

The distribution and status of small carnivore species found in Mount Rainier is unknown. Known species include coyote, red fox, raccoon, pine marten, short-tailed weasel (ermine), long-tailed weasel, mink, spotted and striped skunk, river otter, and bobcat.

Because Mount Rainier National Park is the largest area of late-successional forest in the Cascade Range of southern Washington, it is likely an important habitat for bats. A bat inventory began in summer 2000. Recent investigations documented a nursing colony of the long-eared myotis (*Myotis evotis*) at Longmire. Six other bat species have been recorded in the park, including the state- and federal-sensitive Townsend's big-eared bat (*Plecotus townsendi*), for which there is a single record. All of the park's bat species forest-dwelling insectivores. The park's bats play important roles in controlling insect numbers and in dispersing nutrients within the ecosystem. Large snags and large live trees can serve as important maternity roosts, day roosts, and hibernation shelters.

Large mammals found in the park are black bear, cougar (mountain lion), deer, elk, and mountain goat. Black bears commonly inhabit shrub/forest and subalpine areas and den almost exclusively in forested areas. An estimated 180 black bears inhabit the park for at least some part of the year. An unknown proportion of these 180 bears reside wholly within the park; the rest cross back and forth across park boundaries from national forest and private lands. Because no studies have been conducted to give a more accurate estimate, the population estimate is based on numbers of observations and the amount of suitable habitat.



**Ecological Systems**  
**Mount Rainier National Park**  
 U.S. Department of the Interior / National Park Service  
 DSC / AUGUST 2000 / 105 / 20,138

AFFECTED ENVIRONMENT

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Black bears often can be found in nonwilderness areas as well as in the wilderness. Therefore, there is a high potential for bear/human interaction. Although no hunting is allowed in the park, bear hunting is allowed on all surrounding lands. Poaching of black bears has been known to occur and may reflect the demand for high priced illicit bear parts on the black market.

Little is known about the status of the cougar population in Mount Rainier National Park, but cougars, while hunting for food, could come in contact with park visitors and employees. In 1999 there were more than 30 observations of mountain lions in the park. One of these encounters was a near-attack by a mountain lion on a small child hiking with his parents on a popular wilderness area trail. No one was injured in the incident, but it illustrates that the potential for dangerous encounters with humans exists.

Little information exists on the park's two subspecies of deer populations. The black-tailed deer, the most common subspecies, is found throughout the park up to timberline. The mule deer, the larger subspecies, is uncommon, being found only occasionally at the higher elevations near the park's eastern boundary. The two subspecies readily hybridize, and intergrades may be common on the east side of the park. In summer individuals of both subspecies move to the higher meadows, where they live until snow arrives. In winter they congregate in the lower areas of the park and may leave the park during particularly severe winters.

The elk that inhabit the park are descendants of Rocky Mountain elk (*Cervus elaphus nelsoni*) that were introduced in the vicinity of the park between 1912 and 1933. Today elk inhabit the park in fluctuating numbers. In 1999 an estimated 1,100 animals were in the park, down from 1,500 in the late 1970s (NPS 1999b). Elk in the western half of the park use low-lying

river bottoms. Elk in the eastern part of the park are separated into north and south herds, divided at Cayuse Pass. The two herds are fairly distinct entities, although some mixing is known to occur between the groups. Elk from the northern herd occasionally wander through the Sunrise area and are seen during the early mornings, but they do not stay long because of heavy visitor use in the area (NPS 1996b).

Clearcutting on adjacent national forest and private lands between 1950 and 1969 affected winter range conditions for elk by providing significantly more acreage of higher quality forage than did the mature forests. The higher quality winter habitat probably resulted in greater overwinter survival of elk because they were able to maintain better physical condition over the winter. As the forests have undergone succession and replanting, the quality of forage plants, with respect to elk, has decreased, and overwinter habitat quality has gone down in the succeeding 40 years. Today timber companies use the revenue collected from the fees they charge for hunting on their lands to manipulate habitat to enhance elk winter forage. Many of the elk that overwinter in lowlands surrounding the park use subalpine meadows in the park as summer range.

An estimated 400 mountain goats live in the park. Although information on the status of mountain goat populations is lacking, it is known that goat populations outside the park have been decreasing for several years. Mountain goats in Mount Rainier move from high elevation summer range to lower elevation forested winter range. Some goats probably move seasonally onto national forest lands and are hunted when outside the park. Some animals are probably poached each year from inside or outside the park, and predation, falls, and avalanches kill some. Logging, the creation of access roads, and hunting on adjacent lands may also be affecting the park populations to an unknown degree.

## Birds

More than 229 species of birds have been observed in Mount Rainier National Park, with 90 of these species known to nest in the park. The distribution of birds correlates roughly with life zones in the park. The lowest areas of the park with mature forests (below 3,500 feet) provide suitable habitat for many bird species, including northern spotted owl, northern goshawk, marbled murrelet, barred owl, Cooper's hawk, varied thrush, brown creeper, red-breasted sapsucker, common flicker, pileated woodpecker, gray jay, Steller's jay, red-breasted nuthatch, Townsend's warbler, Pacific-slope flycatcher, chestnut-backed chickadee, and winter wren.

The mixed forests of western white pine, mountain hemlock, and Pacific silver fir of the next zone (3,500 to 5,000 feet) provide habitat for blue grouse, sharp-shinned hawk, golden-crowned kinglet, northern three-toed woodpecker, hermit thrush, and yellow warbler.

Between 5,000 and 6,500 feet, in areas characterized by mixed forest and subalpine meadows, there is habitat for Clark's nutcracker, common raven, red-tailed hawk, American kestrel, rufous hummingbird, mountain bluebird, and Lincoln's sparrow. Many of these birds can be found in other zones, depending on the season.

Snowfields, glaciers, and bare rock outcrops characterize areas above 6,500 feet (over 80 square miles of the park). The white-tailed ptarmigan can be found in this zone along with the gray-crowned rosy finch and the American pipit.

Many species of raptors seasonally inhabit or use the park — osprey, bald eagle, northern harrier, sharp-shinned hawk, Swainson's hawk, rough-legged hawk, golden eagle, and merlin. In addition to the species mentioned above, resident raptors are kestrel, red-tailed hawk, peregrine falcon, western screech-owl, great

homed owl, northern pygmy owl, and northern saw whet owl.

Several species of Neotropical migrant birds pass through the park during migration, such as olive-sided flycatchers (*Contopus borealis*) and Townsend's warblers (*Dendroica townsendi*). However, none are known to depend on park habitats exclusively during the breeding season.

## Amphibians and Reptiles

Eleven species of amphibians and five species of reptiles are known to be present in the park. Terrestrial amphibians include the ensatina, found in or under woody debris; the western redback salamander, found near seepages or streams, under logs and other woody debris; and the Larch mountain salamander. The larch mountain salamander is found in forested and talused environments that provide cool, moist conditions under wood or rock substrates.

Amphibians associated with aquatic systems in the park are tailed frog, Pacific chorus frog, Pacific giant salamander, Cascades frog, northwestern salamander, long-toed salamander, red-legged frog, rough-skin newt, western toad (boreal toad), and Van Dyke's salamander. Tailed frogs and Pacific giant salamanders are found in many park streams. Cascades frogs, northwestern and long-toed salamanders, and rough-skin newts are found in many park wetlands, lakes, and ponds. The red-legged and Pacific chorus frogs are found in some lower elevation ponds and wetlands. Western toads, although historically more abundant, have not been found in great numbers in recent years. During recent surveys, only three western toad breeding populations have been documented in park lakes and ponds.

Amphibians are an ongoing focus of concern due to recent serious worldwide population declines. Amphibians are sensitive indicators of environmental conditions and constitute a major portion of animal biomass in many park

habitats. In forested areas, they may exceed the combined weight of all vertebrates. Amphibians play a key role in the food chain because of their large numbers and their high position.

Recent studies in North Cascades National Park (Liss et al. 1995), Crater Lake National Park, and Mount Rainier National Park have clearly demonstrated that multiple age classes of non-native salmonids (brook trout and others) have a great impact on native lake communities, which evolved under fishless conditions. Fish predation affects lake food webs, altering nutrient cycling, the structure of benthic and macroinvertebrate communities, and the distribution, behavior and abundance of prey species. Fish predation has also been shown to have a major impact on amphibian abundance, behavior, and distribution, especially salamander populations, even when that fish population is not very dense. In some cases, salamander prey have been eliminated from lakes and ponds.

Reptiles found in the park are northwestern garter snake, western terrestrial garter snake, common garter snake, rubber boa, and northern alligator lizard. Surveys conducted by park staff from 1991-1992 documented these species in various habitats throughout the park.

## Fish

The National Park Service has good historical information on native fish populations in Mount Rainier's lakes and rivers, based on fish stocking, creel census data, and known locations of fish passage barriers that would have prevented the establishment of fish in the absence of stocking. However, historical native fish distributions in the park's streams are less fully understood. The present status of native fish populations also are not well understood because of the widespread stocking of nonnative fish, dam construction outside the park, and a general lack of knowledge about the historic and introduced patterns of fish occurrence in park rivers and streams.

No park lakes are known to have supported a fish population before fish stocking began in the early 1900s. This may be attributed to a combination of the following factors: natural barriers to upstream migration, frequent catastrophic events (floods, debris flows), a lack of suitable spawning sites, and low productivity (attributed to low nutrient concentrations). Larger park rivers and streams and most of the lakes were repeatedly stocked, thereby introducing both native and nonnative species into many high elevation areas that were historically devoid of fish. Stocking was halted after 1972, consistent with NPS *Management Policies*. As mentioned above, current research indicates that the presence of nonnative fish has had a negative effect on park amphibian populations.

Eight native fish species are found in the park: rainbow trout/steelhead, coastal cutthroat trout, Dolly Varden, bull trout, mountain whitefish, Chinook salmon, and Coho salmon. Several native species of sculpin also are found in the park, and other sculpin were introduced.

Several hatchery strains of rainbow and cutthroat trout were widely stocked throughout the park and may have hybridized or replaced native stocks within their historic ranges. Other nonnative species that were introduced into the park lakes are hatchery strains of brook trout, which are widely distributed; brown trout, which were only planted in one of the Golden Lakes (and which no longer occur); and some sculpin species (Lake George).

The construction of the Electron Dam on the Puyallup-Mowich drainage and the Alder and LaGrande Dams on the Nisqually have blocked anadromous fish from passage to these rivers and their upstream tributaries in the park. Mud Mountain Dam on the White River also blocks fish passage, but anadromous fish (Chinook, Coho, and steelhead) are transported around the dam, thereby conceivably allowing access to the White River, the West Fork of the White River, and Huckleberry Creek basins.

Chinook salmon have been observed in the White River drainage adjacent to the park boundary. Salmon migration in the Cowlitz and Ohanapecosh Rivers is blocked by dams at Riffe Lake and Mayfield Lake. However, Coho salmon are still transported around the dams. The Carbon River is the only major drainage without constructed dams blocking fish passage. However, a steep canyon about 8 miles downstream from the park boundary may be a partial barrier during certain river flows.

### Invertebrates

With the exception of some aquatic species of macroinvertebrates and zooplankton, little is known about the distribution, abundance, or which species of invertebrates are found in Mount Rainier National Park. Invertebrates may represent 85% of the biomass and are essential to the ecological processes of park old growth forests (Asquith et al. 1990). Invertebrates inhabit many different areas of the coniferous forest of Mount Rainier, including coarse woody debris, leaf litter, soil, understory vegetation, tree canopy and snags. It is estimated that there may be up to 20,000 species of invertebrates in the Pacific Northwest forests (USFS and BLM 1994b).

In addition to the forests, invertebrates also play key roles in the subalpine, alpine, and aquatic areas of the park. Insects act as pollinators of many subalpine flowers. The snowfields and glaciers support a variety of invertebrates, including annelid worms, insects, and spiders. Three native freshwater mussels inhabit the park, Oregon floater, western or Cascades floater, and western pearlshell. Two other species potentially occur in the park, western ridge mussel and the California floater.

### SPECIAL STATUS SPECIES

According to the U.S. Fish and Wildlife Service, the National Marine Fisheries Service,

and park records, eight federally listed threatened or endangered wildlife species occur or have the potential to occur in the park:

- northern spotted owl (*Strix occidentalis caurina*)
- marbled murrelet (*Brachyramphus marmoratus marmoratus*)
- bald eagle (*Haliaeetus leucocephalus*)
- gray wolf (*Canis lupus*)
- Canada lynx (*Lynx canadensis*)
- grizzly bear (*Ursus arctos*)
- chinook salmon (*Oncorhynchus tshawytscha*)
- bull trout (*Salvelinus confluentus*)

In addition, the coastal cutthroat trout (*O. clarki clarki*), proposed for federal threatened status, occurs in the park, although the currently listed population (Columbia River) is believed to have been introduced (NPS 1920 *et seq.*). The Coho salmon (*O. kisutch*) is also proposed for federal listing and has been historically found in the park; current populations within the park are unknown. Although population sizes and numerical trends within the park are generally unknown for most species, some detailed study has occurred regarding northern spotted owls, marbled murrelets, and bull trout, and some analysis of potential lynx habitat has been done adjacent to the park's northeastern boundary. (See table 10 for more information on habitat needs and occurrence.)

The U.S. Fish and Wildlife Service has identified the following other species as occupying the park:

- northern goshawk (*Accipiter gentilis*)
- olive-sided flycatcher (*Contopus cooperi*)
- peregrine falcon (*Falco peregrinus*)
- long-eared myotis (*Myotis evotis*)
- long-legged myotis (*M. volans*)
- Cascades frog (*Rana cascadae*)
- western toad (*Bufo boreas*)
- Van Dyke's salamander (*Plethodon vandykei*)
- Larch mountain salamander (*P. larselli*)
- Fender's soliperlan stonefly (*Soliperla fenderi*)

Other species of concern that may inhabit the park are the following:

- California wolverine (*Gulo gulo luteus*)
- Pacific fisher (*Martes pennanti pacifica*)
- Valley silverspot (*Speyeria zerene bremeri*) (a butterfly)
- Whulge checkerspot (*Euphydryas editha taylori*) (a butterfly)

Many federally listed species also are listed by the Washington Department of Fish and Wildlife as endangered, threatened, candidate, or sensitive species. Of the species identified above, northern spotted owl, peregrine falcon, gray wolf, grizzly bear, and fisher are listed as state endangered. Marbled murrelets, bald eagles, ferruginous hawk (*Buteo regalis*), and Canada lynx have state threatened status. The northern goshawk, California wolverine, Pacific Townsend's big-eared bat (*Plecotus townsendii townsendii*), Chinook salmon, bull trout, western toad, Van Dyke's salamander, and California floater (*Anodonta californiensis*) are all state candidate species, and the larch mountain salamander is a state sensitive species.

The following 14 rare plant species identified as sensitive by the state of Washington are known to occur in Mount Rainier National Park. Of these, the obscure Indian paintbrush and Mount Rainier lousewort are considered endemic to the park and the local area.

- obscure Indian paintbrush (*Castilleja cryptantha*)
- Mount Rainier lousewort (*Pedicularis rainierensis*)
- lance-leaved grapefern (*Botrychium lanceolatum*)
- common moonwort (*B. lunaria*)
- northern moonwort (*B. pinnatum*)
- northern microseris (*Microseris borealis*)
- Wheeler's bluegrass (*Poa nervosa*)
- crested wood fern (*Dryopteris cristata*)
- curved woodrush (*Luzula arcuata*)
- northern wild licorice (*Galium kamtschaticum*)
- skunky Jacob's-ladder (*Polemonium viscosum*)
- pygmy saxifrage (*Saxifraga rivularis*)
- blackened sedge (*Carex atrosquama*)
- tall agoseris (*Agoseris elata*)

The status, habitat needs, and occurrence of special status species, including federal and state listed species, are shown in table 10.

TABLE 10: SPECIAL STATUS SPECIES, INCLUDING FEDERALLY LISTED AND STATE-LISTED SPECIES

Species	Status <sup>a</sup>		Habitat Needs/Occurrence
	FWS	WA	
<b>Birds</b>			
Northern spotted owl ( <i>Strix occidentalis caurina</i> )	FT	SE	<p>The northern spotted owl is a medium sized nocturnal owl that preys primarily on small mammals. The owl is strongly associated with mature or old growth forests that are structurally complex – they contain trees of several species, sizes, and ages, contain standing and down dead trees, and have multistoried canopies. Moreover, the birds require large amounts of such habitat. Median home range sizes are typically on the order of 3,000 to 5,000 acres per pair. Spotted owls nest in cavities or platforms in trees, and in good habitat, pairs are typically spaced about 1–2 miles apart. Spotted owls are long-lived, territorial birds, often spending their entire adult life in the same territory.</p> <p>Habitat degradation and loss threaten this species with extinction. Much of the remaining habitat is highly fragmented. In addition, barred owls (<i>Strix varia</i>) have invaded much of the range of the northern spotted owl during the last 30 years and have displaced and hybridized with spotted owls (Dunbar et al. 1991; Thomas et al. 1993; Hamer et al. 1994). Since listing, Anderson and Bumham (1992) indicate northern spotted owl populations are continuing to decline throughout their range and this decline may be accelerating. Large scale analysis of the northern spotted owl over 23% of its range, including Mount Rainier National Park, indicated that populations were either relatively stable or were experiencing a decline (3.9% annually for female owls) (Franklin et al. 1999). Critical habitat for the species has been designated within Lewis and Pierce Counties, but the designation does not include lands within Mount Rainier National Park.</p> <p>The northern spotted owl is an uncommon year-round resident of the park (breeding between March and September), and the entire park is a congressionally reserved area for spotted owl habitat. Essentially, any forested habitat up to 4,800 feet is considered northern spotted owl habitat. In the park, 68,000 acres are suitable habitat. Approximately 85% of that suitable habitat was surveyed between 1997 and 1998. A total of 13 pairs of adult owls, nine activity sites with at least one adult and seven fledglings were documented. In addition, six nest locations were identified and 29 birds were banded. Many known locations for spotted owls are within 1 to 2 miles of the park boundaries. They have been reported in forests along Westside Road, near the Longmire complex, at Ohanapecosh, near the Sunrise complex, along the State Route 410 corridor, and along Carbon River Road. Numerous nest activity sites have been located in the park.</p>
Marbled murrelet ( <i>Brachyramphus marmoratus</i> <i>marmoratus</i> )	FT	ST	<p>The marbled murrelet is a small seabird that feeds on fish in ocean waters within 1 mile of the shore. Due to their secretive nature and cryptic coloration, information on the distribution and abundance of marbled murrelets in Washington has been difficult to gather (NPS 1996a). Marbled murrelets nest in forested areas up to 50 miles from their saltwater foraging areas. Nest trees need to be in a stand that is open enough for them to fly through, yet the canopy must have enough cover to hide the nests from predators. Typically such conditions have only been found in old growth or later seral stands, however some younger stands with a high degree of structural diversity and limb-malforming infestations (i.e., mistletoe) may also be suitable.</p> <p>The marbled murrelets' threatened status is thought to be principally due to a loss of nesting habitat due to commercial timber harvesting. Forest fragmentation also may be making nests near forest edges vulnerable to predation by other birds, such as jays, crows, ravens, and great horned owls. In addition, increased human activities in forests, such as picnic grounds, can attract corvids and thus increase the chances of predation (USFWS 1991, 1992). Critical habitat for the species has been designated within Lewis and Pierce Counties, but the designation does not include lands in Mount Rainier National Park.</p> <p>Potential marbled murrelet habitat is distributed throughout the park, especially along major river corridors below 3,500 feet. Confirmed nesting occurs in the northwest corner of the park in the Carbon River and Mowich River drainages, and murrelets have been detected along the Nisqually River within the park.</p>

Species	Status <sup>a</sup>		Habitat Needs/Occurrence
	FWS	WA	
<p>Approximately 22,000 acres of the park are considered suitable nesting habitat. The best nesting habitat is in lower old-growth forests below 750 meters. Mid-level forests (750-1450 m) have some suitable nesting habitat. The old growth forests in the park's western river valleys may be some of the best remaining nesting habitat in the southern Puget Sound area because they support large, intact stands of old-growth forest within 40 miles of the birds' marine foraging area.</p> <p>Limited non-systematic inventories for murrelets were conducted from 1995-1997, primarily in the northwestern portion of the park. A total of 891 murrelet detections were made in 1995, 92 in 1996 and 220 in 1997. These detections represent an unknown number of murrelets because an individual bird may be detected numerous times over the course of the monitoring season. Some of these detections, however, were identified as an indication of nesting occupancy based on observations of bird behavior on 42 occasions in 1995, 3 in 1996 and 69 in 1997. In addition, four other suspected nesting areas, based on repeated observations of murrelets exhibiting nesting behavior, were identified in 1997.</p>			
Bald eagle <sup>b</sup> ( <i>Haliaeetus leucocephalus</i> )	FT	ST	Bald eagles primarily occur along Washington's coast, rivers, and large lakes and reservoirs. They probably just migrate through the park. Wintering bald eagles may occur in the vicinity of Mount Rainier from October 31 through March 31. It is possible that bald eagles enter the park during the summer months to fish the sub alpine lakes; however, there is no record of bald eagles nesting in the park. Known nesting occurs 15 miles outside the park's western boundary.
Northern goshawk ( <i>Accipiter gentilis</i> )	FSC	SC	Generally, goshawks nest in trees in mature or old growth coniferous forests. Goshawks have been observed in Mount Rainier National Park regularly by visitors and biologists.
Olive-sided flycatcher ( <i>Contopus cooperi</i> )	FSC	-	This flycatcher prefers forest edges adjacent to open areas, such as bums, montane meadows, and sub alpine parklands. This species breeds in the park.
Oregon vesper sparrow ( <i>Pooecetes gramineus affinis</i> )	FSC	SC	This species does not occur in the park.
Peregrine falcon <sup>c</sup> ( <i>Falco peregrinus</i> )	FSC	SE	Peregrine falcons nest mainly on cliffs along rivers or near lakes. In the spring and fall, migrant peregrine falcons may be present near the park for short periods. Nesting peregrines occur in the vicinity of Tum Tum Peak on the park's west side.
Ferruginous hawk ( <i>Buteo regalis</i> )	--	ST	Nests in cliffs or trees; frequents arid plains and open rangeland. Ferruginous hawks are a migrant species in Mount Rainier.

**Mammals**

Gray wolf ( <i>Canis lupis</i> )	FE	SE	Gray wolves are wide-ranging carnivores that inhabit forests and open tundra. Hunting and other human activities eliminated the gray wolf from Washington by the early 20th century.
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However, wolves appear to be naturally recolonizing Washington, especially northern Washington, from Canada.

Mount Rainier contains ample habitat for gray wolves and abundant prey. Historically, the gray wolf was found in the park. Taylor and Shaw (1927) cite numerous observations of wolves from the late 1800s into the 1920s. There are 26 reported wolf sightings in the park's computerized database, which dates back to 1980; however, no observations have been verified by biologists in the last 80 years. No systematic surveys, however, have been conducted in the park.

**TABLE 10: SPECIAL STATUS SPECIES, INCLUDING FEDERALLY LISTED AND STATE-LISTED SPECIES (continued)**

Species	Status <sup>a</sup>		Habitat Needs/Occurrence
	FWS	WA	
Canada lynx ( <i>Lynx canadensis</i> )	FT	ST	In the Cascade Mountains, lynx live in the spruce-fir forests of the high mountains. Older, mature forests with downed trees and windfalls provide cover for denning sites, escape, and protection from severe weather. The distribution and abundance of lynx tend to be tied to that of its primary prey, the snowshoe hare. Canada lynx probably never have been abundant in the lower 48 states because of a lack of lynx and snowshoe hare habitat. Their numbers also declined due to overtrapping in the 1980s and from a loss of forest habitat caused by development and urbanization, forest fire suppression, and unsuitable types of forest management. Bobcats and coyotes also have spread into lynx habitats, because packed snow trails were created by recreational activities, and the bobcats and coyotes have outcompeted the lynx for food and space.
<p>Although Mount Rainier has suitable habitat for lynx and snowshoe hare in subalpine forests and alpine areas below treeline, there are no confirmed reports of the species in the park since Taylor and Shaw (1927) documented lynx in the 1920s. No systematic surveys, however, have been conducted in the park.</p>			
Grizzly bear ( <i>Ursus arctos</i> )	FT	SE	Grizzly bears are omnivores that inhabit semi-open country, usually in mountain areas. They require large home ranges from 30 to 100 square miles in size (Van Gelder 1982). The park contains suitable grizzly bear habitat, but there have never been confirmed sightings of grizzlies in the park. In 1993, grizzly bear tracks were identified adjacent to the west side of the park.
California wolverine ( <i>Gulo gulo luteus</i> )	FSC	SC	The California wolverine is a resident of high elevation coniferous forests and subalpine areas. Wolverines use vast areas for hunting, sometimes as much as 100 square miles (Van Gelder 1982). Although noted as a potential inhabitant of Mount Rainier by the U.S. Fish and Wildlife Service and thought likely to be present, the California wolverine has not been documented in the park since 1933.
Pacific fisher ( <i>Martes pennanti pacifica</i> )	FSC	SE	Pacific fishers prefer dense forests with extensive, continuous canopies and complex forest floor structure, and they are often associated with wetland forests and riparian areas. Fisher populations have declined throughout much of their range during the last half of the 19th century and the early part of this century, and they may be on the verge of extinction in Washington.
<p>Mount Rainier contains suitable habitat for fishers, including large forage areas away from human influences, but there have been no confirmed sightings. Jones and Raphael (1991) conducted a systematic study on the abundance and habits of fishers in the southeastern corner of the park but did not detect them. Pacific fishers have not been documented in the park since 1947.</p>			
Western gray squirrel ( <i>Sciurus griseus</i> )	—	ST	This species does not occur in the park.
Long-eared myotis ( <i>Myotis evotis</i> )	FSC	—	This species typically prefers forestlands and heavy chaparral. (Sumner and Dixon 1953). A nursing colony has been documented at Longmire.
Long-legged myotis ( <i>Myotis volans</i> )	FSC	—	This bat forages over ponds, streams, open meadows, and forest clearings. Night roosts are usually in caves or mines. It has been identified as being present in Mount Rainier.

**TABLE 10: SPECIAL STATUS SPECIES, INCLUDING FEDERALLY LISTED AND STATE-LISTED SPECIES (continued)**

Species	Status #		Habitat Needs/Occurrence
	FWS	WA	
Pacific Townsend's big-eared bat <i>(Plecotus townsendii townsendii)</i>	FSC	SC	Townsend's big-eared bats hibernate in caves and use caves, lava tubes, and abandoned buildings for breeding and roosting sites. Nursery colonies are extremely sensitive to human activity, and sites are readily abandoned if disturbed. The bat was confirmed in the park near Longmire in 2000.
<b>Fish</b>			
Chinook salmon (Puget Sound "ESU") <i>(Oncorhynchus tshawytscha)</i>	FT	SC	Chinook are easily the largest of any salmon, with adults often exceeding 40 pounds. Chinook use a variety of freshwater habitats, but it is more common to see them spawn in larger main stem rivers or tributaries.  In Mount Rainier, likely habitat for Chinook salmon includes the Carbon, White, Mowich, and Puyallup Rivers, the West Fork of the White River, and Huckleberry Creek. In the past Chinook salmon have been documented in the Carbon River just outside the park boundary (D. Nauer, Washington Dept. of Fish and Wildlife, pers. com.). Salmon are likely to be present in small numbers in the park, although the park staff has not documented them as being present or spawning.
Bull trout <i>(Salvelinus confluentus)</i>	FT	SC	Bull trout habitat is characterized by clear cold water, silt-free rocky substrate in riffle run areas, well-vegetated streambanks, abundant in stream cover, deep pools, relatively stable flow regime and streambanks, and productive fish and aquatic insect populations. Historically, they were found in most major river systems in the Pacific Northwest. In Mount Rainier, bull trout are present in the White, West Fork, Carbon, and Puyallup Rivers and their tributaries.
Coho salmon <i>(Oncorhynchus kisutch)</i>	FPROP	--	Coho were historically found in the White, Carbon, North and South Puyallup and Mowich rivers. No recent surveys have been conducted to determine their current presence in the park. It is likely, however that they are present in small numbers in these rivers today.
Coastal cutthroat trout <i>(Oncorhynchus clarki clarki)</i>	FPROP FT	_	The USFWS listed the eastern Cascades portion of the coastal cutthroat as threatened in April 1999. Coastal cutthroat on the west side of the Cascades were found not warranted for listing at the same time. Coastal cutthroat have been documented in the park; however, this documentation suggests that this species was introduced on the east side and was not historically present in park waters there.
River lamprey <i>(Lampetra ayresi)</i>	FSC	SC	This species does not occur in the park.
Pacific lamprey <i>(Entosphenus tridentata)</i>	FSC	_	This species does not occur in the park.
<b>Reptiles and Amphibians</b>			
Northwestern pond turtle <i>(Clemmys marmorata)</i>	FSC	SE	This species does not occur in the park.
Oregon spotted frog <i>(Rana pretiosa)</i>	FC	SE	This species does not occur in the park.

TABLE 10: SPECIAL STATUS SPECIES, INCLUDING FEDERAL AND STATE-LISTED SPECIES (continued)

Species	Status <sup>d</sup>		Habitat Needs/Occurrence
	FWS	WA	
Red-legged frog <sup>d/</sup> ( <i>Rana aurora</i> )	–	–	The red-legged frog occurs in park low elevation (below 4,000 feet) wetlands.
Tailed frog <sup>d</sup> ( <i>Ascaphus treui</i> )	–	–	Tailed frogs inhabit many of the park's clear, fast-flowing streams.
Cascades frog ( <i>Rana cascadae</i> )	FSC	–	Cascade frogs are a montane species, primarily occurring above 800 meters in montane meadows, marshes, and ponds (U.S. Forest Service 1995). Distribution of the Cascades frog in the park is not well known. Surveys have documented these amphibians in the Huckleberry; Carbon, Mowich; Puyallup, Nisqually, Cowlitz, Ohanapecosh, and White River.
Western toad ( <i>Bufo boreas</i> )	FSC	SC	Western toads were formerly more abundant, but recently they have been found only in a few montane lakes and wetlands in the park.
Columbia torrent salamander ( <i>Rhyacotriton kezeri</i> )	FSC	SC	This species does not occur in the park.
Larch Mountain salamander ( <i>Plethodon larselli</i> )	FSC	SS	Larch mountain salamanders are found in forested and talus environments that provide cool, moist conditions under wood or rock substrates. The salamander has been found near the park boundary and is in the park.
Van Dyke's salamander ( <i>Plethodon vandykei</i> )	FSC	SC	Van Dyke's salamander is found in a variety of habitats, including streambanks, upland forests, talus, and seeps, at a large range of elevations. Salamanders have been documented in the Mowich drainage and just outside the park boundary near Longmire.
<b>Mollusks</b>			
California floater (mussel) ( <i>Anodonta californiensis</i> )	–	SC	Freshwater mollusks can inhabit permanent water bodies of all sizes. Mussels may also be found in sand-gravel substrates that are stable. The California floater is expected to occur in the park but has not yet been documented.
<b>Insects</b>			
Valley silverspot ( <i>Speyeria zerene bremeri</i> )	FSC	SC	No records of this species in the park have been identified, but they may occur in the park.
Whulge (Edith's) checkerspot ( <i>Euphydryas editha taylori</i> )	FSC	SC	No records of this species in the park have been identified, but they may occur in the park.
Fender's soliperlan stonefly ( <i>Soliperla fenderi</i> )	FSC	–	This species has been identified on three occasions near Westside Road.
<b>Plants</b>			
Water howellia ( <i>Howellia aquatilis</i> )	FT	–	Surveys in potential habitat have not identified this species, and it is believed not to occur in the park.
Kincaid's lupine ( <i>Lupinus sulphureus kincaidii</i> )	FP	–	This species and its habitat do not occur in the park.

TABLE 10: SPECIAL STATUS SPECIES, INCLUDING FEDERAL- AND STATE-LISTED SPECIES (continued)

Species	Status #		Habitat Needs/Occurrence
	FWS	WA	
Obscure Indian paintbrush ( <i>Castilleja cryptantha</i> )	—	SS	This small (6 to 12 inches) multistemmed perennial plant is endemic to Mount Rainier National Park and the local area. The plant is known to exist at 25 sites in Mount Rainier and in 2 sites adjacent to the park's border. Populations are located in moist, well-drained meadows in the northern part of the park. Surveys showed that individual populations often had numerous stems/individuals but no seedlings. Based on surveys, there apparently is great variability in population trends among locations and between years.
Pale larkspur ( <i>Delphinium leucophaeum</i> )	FSC	—	This species does not occur in the park.
Mount Rainier lousewort ( <i>Pedicularis rainierensi</i> )	—	SS	This plant species has been observed in 34 locations in subalpine meadows throughout the park.
Lance-leaved grapefern ( <i>Botrychium lanceolatum</i> )	—	SS	This plant species has been observed in three locations in the park; however, no additional information is available on locations of occurrence or habitat.
Common moonwort ( <i>B. lunaria</i> )	—	SS	No information is available on locations of occurrence or habitat, although one voucher specimen of this species is in the park herbarium.
Northern moonwort ( <i>B. pinnatum</i> )	—	SS	There are two voucher specimens (1888, c. 1960) of this plant from unspecified locations in the park. No additional information is available on locations of occurrence or habitat.
Northern microseris ( <i>Microseris borealis</i> )	—	SS	This plant species has been observed in four locations in the park; however, no additional information is available on locations of occurrence or habitat.
Wheeler's bluegrass ( <i>Poa nervosa</i> )	—	SS	Surveys for this species have not been completed. Based on habitat availability, it is expected to occur in the park.
Crested wood-fern ( <i>Dryopteris cristata</i> )	—	SS	Surveys for this species have not been completed. Based on habitat availability, it is expected to occur in the park.
Curved woodrush ( <i>Luzula arcuata</i> )	—	SS	This plant species has been observed in one location in the park; however, no additional information is available on locations of occurrence or habitat.
Northern wild licorice ( <i>Galium kamtschaticum</i> )	—	SS	This plant species has been observed in the park; however, no additional information is available on locations of occurrence or habitat.
Skunky Jacob's-ladder ( <i>Polemonium viscosum</i> )	—	SS	There is one voucher specimen (1896) of this species in the park herbarium. No additional information is available on locations of occurrence or habitat.
Pygmy saxifrage ( <i>Saxifraga rivularis</i> )	—	SS	There is one voucher specimen (1895) of this species in the park herbarium. No additional information is available on locations of occurrence or habitat.

TABLE 10: SPECIAL STATUS SPECIES, INCLUDING FEDERAL AND STATE-LISTED SPECIES (CONTINUED)

Species	Status <sup>a/</sup>		Habitat Needs/Occurrence
	FWS	WA	
Blackened sedge ( <i>Carex atrosquama</i> )	—	SS	There is one voucherspecimen (1895) ofthis species in the park herbarium. No additional information is available on locations of occurrence or habitat.
Tall agoseris ( <i>Agoseris elata</i> )	—	SS	Surveys for this species have not been completed. Based on habitat availability, it is expected to occur in the park.

a/ Status:

**FE = Federally Endangered:** Listed by the U.S. Fish and Wildlife Service as a species that is in danger of extinction throughout all or a significant portion of its range.

**FT = Federally Threatened:** Listed by the U.S. Fish and Wildlife Service as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**FPROP = Federal Proposed:** Species for which the USFWS has proposed in the *Federal Register* listing as threatened or endangered.

**FC = Federal Candidate:** Species for which the U.S. Fish and Wildlife Service has sufficient information to propose for listing as threatened or endangered.

**FSC = Federal Species of Concern:** Species whose conservation standing is of concern to the U.S. Fish and Wildlife Service, but for which status information is still needed.

**SE = Washington State Endangered:** Any species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

**ST = Washington State Threatened:** Any species native to the state of Washington that is likely to become an endangered species within the

foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

**SC = Washington State Candidate:** Includes species that the department will review for possible listing as state endangered, threatened, or Sensitive. A species will be considered for designation as a state candidate if sufficient evidence suggests that its status may meet the listing criteria defined for state endangered, threatened, or sensitive.

**SS = Washington State Sensitive:** Any species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats.

— = No designation

b/ Bald eagles were proposed for delisting on July 6, 2000. Delisting is expected to occur in October 2000. They will remain fully protected species.

c/ The peregrine falcon was delisted in August 1999. Peregrines remain fully protected species and are state listed.

d/ The red-legged frog and tailed frog have been on many USFWS service lists and so they remain on this list, although not included in the March 14, 2001 letter from the USFWS.

## GEOLOGIC HAZARDS

### HISTORY

Mount Rainier has an extensive historic geologic record of activity, including lava flows, ash eruptions, avalanches, and debris or mudflows. The volcano has erupted many times. The last major eruptions occurred approximately 1,000 years ago. The most recent eruptions to have produced a recognizable deposit (pumice) occurred between 1820 and 1854. Unverified newspaper reports also report near-summit eruptions (ash and steam) as recently as 1894, although these were too small to produce distinguishable deposits on the lower slopes of the volcano. The most recent eruption to have produced lava occurred between 1,000 and 2,000 years ago. Today, the threat of mudflows is particularly acute because of the weakened array of rocks altered by hot acidic waters within the volcano and the presence of an extensive glacial cap. Earthquakes, although they may be associated with periodic volcanic activity, are also a threat in and of themselves.

### POTENTIAL HAZARDS

#### Volcanic Eruptions

As an active volcano, Mount Rainier presents volcanic geologic hazards that could be devastating to park visitors, employees, and facilities within and beyond the park. Other geologic hazards include flooding, glacial outburst floods, snow avalanches, landslides, and rock falls. Flooding hazards were discussed above in the "Floodplains" section; the following discussion focuses primarily on potential volcanic hazards because these would likely be more devastating than the more frequent geologic hazards such as avalanches, rockfalls and glacial outburst floods.

The National Research Council recognized the potential for considerable geologic hazards

when they named Mount Rainier a Decade Volcano Study Area. The primary geologic hazard at Mount Rainier is debris flows (Scott et al. 1995; National Research Council 1994; Hoblitt et al. 1995). Debris flows and pyroclastic flows have caused about 86% of the loss of life worldwide in 20th century volcanic disasters (Blong 1984; Tilling et al. 1989). It has also been suggested that some types of debris flows could occur without a warning from precursor-type volcanic activity (Scott et al. 1995). Other hazards at Mount Rainier are pyroclastic flows, lateral blasts, tephra fall, lava flows, and nonvolcanic geologic hazards such as avalanches and landslides, as discussed below. Development sites in the park that are exposed to these types of hazards are identified in table 11.

The National Research Council (1994) has stated that volcanic hazards or volcano related events that are likely to pose threats to persons or property include the following:

- *volcanic eruptions* — the eruption of ash flows and tephra (ash or pumice)
- *edifice failure* — the gravitational collapse of a portion of the volcano
- *glacial outburst floods* — the sudden release of meltwater from glaciers and snowpack or from glacier dammed lakes on the edifice
- *lahars or debris flows, and debris avalanches* — gravitational movement of commonly water-saturated volcanic debris down the steep slopes of the volcano and into nearby valleys

TABLE 11: SITES AT MOUNT RAINIER WITHIN VOLCANIC AND NONVOLCANIC HAZARD ZONES

Park Site	Case I Debris Flow Zone	Case II Debris Flow Zone	Case III Debris Flow Zone	Hydro- thermally Altered Rock	Non- volcanic Geologic Hazard	Pyroclastic Flow Zone
Tahoma Woods	X			X		
Nisqually entrance		X		X	X	X
Sunshine Point campground		X		X	X	X
Kautz Creek			X		X	X
Westside Road	X	X	X		X	X
Longmire			X		X	X
Cougar Rock campground			X		X	X
Paradise						X
Camp Muir	X					X
Narada Falls picnic area	X				X	X
Box Canyon picnic area			X	X		X
Ohanapeosh		X			X	X
Stevens Canyon entrance		X			X	
White River entrance		X		X		X
White River campground			X	X	X	X
Camp Schurman	X				X	X
Sunrise						X
Mowich Lake						X
Carbon River entrance		X			X	X
Falls Creek picnic area		X			X	X
Ipsut Creek campground			X		X	X

## Debris Flows

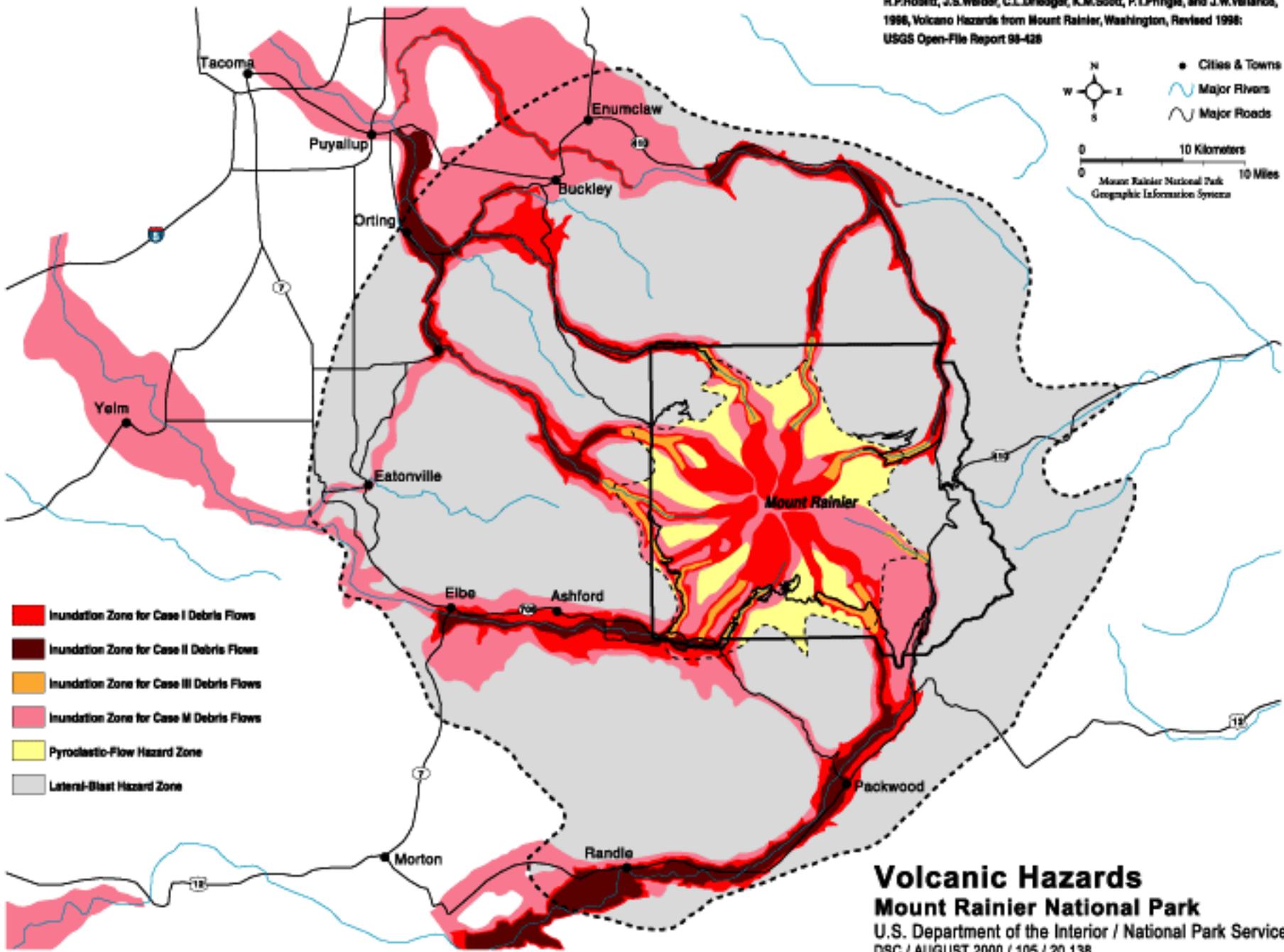
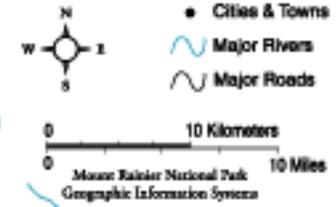
Recent geologic mapping and studies of debris flow deposits in valleys surrounding the volcano have contributed to a greater understanding of Mount Rainier's volcanic hazards. This research was used to create hazard assessments (hazard zones) that identify where debris flows could occur and at what frequency (recurrence interval) and magnitude they might occur. Several investigations have provided detailed mapping of debris flow hazard zones at Mount Rainier (Scott et al. 1995; Scott and Vallance 1995; Hoblitt et al. 1995).

- *Case M debris flows* — These are extreme case I flows. The Osceola mudflow, which reached the Puget Sound region near

Auburn, nearly 5,600 years ago is an example of a case M debris flow.

- *Case I debris flows* — These are the largest flows and may be composed of cohesive debris that originates as enormous avalanches of weak, chemically altered rock from the volcano. The average recurrence interval of a case I debris flow is estimated at 500 to 1,000 years. The Electron mudflow, which occurred about 550 years ago is an example.
- *Case II debris flows* — These are composed of relatively large noncohesive debris flows containing coarser materials than case I flows. Case II flows have an estimated recurrence interval of 100 to 500

R.P.Hoblitt, J.S.Weider, C.L.Driedger, K.M.Scott, P.T.Pringle, and J.W.Vallanos,  
1996, Volcano Hazards from Mount Rainier, Washington, Revised 1998:  
USGS Open-File Report 98-428



- Inundation Zone for Case I Debris Flows
- Inundation Zone for Case II Debris Flows
- Inundation Zone for Case III Debris Flows
- Inundation Zone for Case M Debris Flows
- Pyroclastic-Flow Hazard Zone
- Lateral-Blast Hazard Zone

**Volcanic Hazards**  
**Mount Rainier National Park**  
U.S. Department of the Interior / National Park Service  
DSC / AUGUST 2000 / 105 / 20,138

**back of map**

years. Such an event occurred at Kautz Creek in 1947.

- *Case III debris flows* — These may be moderately large debris avalanches or small, noncohesive debris flows that typically reach to the base of the volcano near the park boundary. The recurrence interval for case III flows is estimated at 1 to 100 years.

Debris flows, in terms of the potential effects and probability of occurrence, constitute the greatest volcanic hazard in the Cascade Range (Hoblitt et al. 1995). Debris flows consist of slurries of water and sediment (60% or more by volume) that look and behave much like flowing concrete. Debris flows are sometimes called mudflows or, when they originate on volcanoes, lahars (Hoblitt et al. 1995).

The White River Valley is the site of the most devastating mudflow Mount Rainier is known to have unleashed. The Osceola mudflow dates from about 5,600 years ago. It exhumed the northeast flank and summit of Mount Rainier and inundated the valleys of the White River and its West Fork, covering a total area of more than 195 square miles (Dragovitch et al. 1994). The mudflow, estimated to contain more than 4.9 billion cubic yards of material, deposited a layer up to 30.5 meters (100 feet) thick and buried the areas where the towns of Enumclaw, Buckley, Orting, Puyallup, Sumner and Auburn are now located. A portion of the mountain also collapsed and formed the Paradise lahar.

More recent and smaller collapses from the west flank of Mount Rainier produced the Round Pass mudflow (Nisqually and Puyallup Rivers: 2,800 years ago; more than 200 million cubic yards) and Electron mudflow (Puyallup River: 550 years ago; 340 million cubic yards) among others (Crandell 1971; Scott et al. 1995). For comparison, Mud Mountain Dam (White River) has a capacity of approximately 170 million cubic yards and Alder Dam

(Nisqually River) has a capacity of approximately 375 million cubic yards. Mud Mountain Dam might contain an Electron-sized mudflow, but because the Alder Reservoir is water-filled, an Electron-sized event could lead to dam failure with catastrophic results. Neither dam could influence an Osceola-sized mudflow.

The Paradise lahar (4,500–5,000 years ago) inundated the Nisqually River Valley, at least to the former town of National. The National lahar (1,200–1,700 years ago) retained a significant amount of sediment as it traveled downstream onto the Puget Sound lowland (below La Grande).

Many developed sites in the park are located on debris flow deposits in valley bottoms. Preliminary results of geologic mapping on Mount Rainier indicate there is no apparent trend toward a decreasing eruption volume at Mount Rainier. Thus, potentially sizable eruptions would continue into the future (Sisson 1995), resulting in additional debris flows and other hazards.

Recent geologic mapping of the volcano has shed important new light on which valleys in the park might host a large debris flow or small debris avalanche (Sisson 1995; Zimbelman 1995; Crowley and Zimbelman 1997). This mapping identified zones of rock on the volcanic edifice that have been weakened by fractures, faults, and the alteration of minerals to weak clay minerals by hot gases (hydrothermal alteration). Valleys that have these weakened rocks in their headwaters, particularly where these rocks are undercut by glaciers, are more likely to host debris flows. In general, the zone of maximum hydrothermal alteration follows a northeast to southwest band that bisects the volcano. Fractures caused by downslope movement of the hydrothermally altered rocks have been mapped at Little Tahoma Peak, on the east side of the volcano and at Sunset Amphitheater, on the west side.

The Tahoma Creek, Nisqually River, White River, Muddy Fork of the Cowlitz River, and Puyallup River all descend from areas of weakened rock.

Pyroclastic flows are another volcanic hazard. These are dense mixtures of hot rock fragments and gases that flow down valleys during eruptive periods. Because of their high speed and high temperature, pyroclastic flows may destroy virtually everything in their paths. Although pyroclastic flows may occur as a result of an eruption, their pathway would likely be limited to the area within the park boundary.

### Other Hazards

As mentioned, other volcanic hazards at Mount Rainier include lateral blasts (such as occurred at Mount St. Helens in 1980), tephra fall, and lava flows. All the park's developed areas are within a 22-mile (35-kilometer) diameter lateral blast zone mapped by Crandell and Hoblitt (1986) and Hoblitt et al. (1995). Maps for tephra fallout hazard are not detailed enough to distinguish among park developed areas because Mount Rainier is within tephra fallout zones from several other Cascade Range volcanoes. Past tephra fallout, however, from eruptions of Mount Rainier has been largely confined to the east half of the park due to prevailing westerly winds (Crandell 1967). Lava flow hazard is minimal at all sites (Crandell 1967; Hoblitt et al. 1995).

Nonvolcanic geologic hazards also occur at Mount Rainier. Snow avalanches, rockfalls (often related to weakened areas, many of them hydrothermally altered), landslides, debris torrents, and other hazards have occurred throughout the park. On December 14, 1963, the largest rockslides on Mount Rainier in historic time occurred on its east flank. About 4 billion cubic feet of rock fell in a series of avalanches from the steep side of Little Tahoma Peak (Crandell 1969). Although

most rock fell on the Emmons glacier, some traveled to within 0.6 mile of the White River campground (Scott and Vallance 1994).

Additional information on volcanic and nonvolcanic hazards for specific areas of the park is provided in the following sections.

**Nisqually Entrance and Sunshine Point Campground.** All current development sites in the Nisqually Valley below the junction of Tahoma Creek are threatened by hydrothermally altered rocks in the Sunset Amphitheater area (Zimbelman 1995). This site is located in a case II debris flow inundation zone, with a recurrence interval estimated at 100–500 years (Hoblitt et al. 1995).

**Westside Road.** Westside Road was closed at Dry Creek due to outburst flood activity on Tahoma Creek. Below Dry Creek the road is in a case III debris flow inundation zone. After leaving the old picnic area, the road ascends out of the case III debris flow inundation zone into the case II and I inundation areas, before dropping in elevation into a case III inundation area at the bridge across the Puyallup River. The north end of the road on Klapatche Ridge is outside the debris flow hazard area. The unstable bedrock on the slopes of Mount Wow creates a nonvolcanic geologic hazard. These slopes have sent several mass movements into the Tahoma Creek valley (Scott et al. 1995). The road crosses a small talus field and rockfall hazard east of Lake Allen, and a larger talus field / rockfall and snow avalanche area between Dry Creek and the former picnic area. Visitors parking at the current end of the road (Dry Creek) are exposed to safety hazards from rockfall.

**Longmire.** The Longmire developed area (including district offices, museum, National Park Inn, gas station, warehouse, garages, employee residences, duplexes, Community Building, wastewater treatment plant, Old Longmire campground, and various associated

facilities) is on an alluvial fan at the mouth of a small canyon on the Nisqually River. This landform is built by debris flows, the most recent of which is less than 500 years old (Crandell 1967). This site was mapped in a case III debris flow inundation zone and is also vulnerable due to its proximity to the volcano.

Recent hydraulic modeling (NPS 1997b) indicates that 100-year and 500-year precipitation floods would be contained in the Nisqually River and would not flood the campground. The model output also indicated that a 500-year outburst flood on the Nisqually River would exceed the channel capacity and flood the campground.

Campground flooding occurred in the 1950s as a result of outburst flood activity from the Nisqually Glacier when a sudden and massive amount of water was released from the glacier. Glacier activity has decreased over the past few decades, and the likelihood that Longmire would flood from such an event in the near future is negligible.

The mineral springs and meadows just northwest of the Longmire developed area are a potential source of lethal volcanic gases. Carbon dioxide, carbon monoxide, and other potentially dangerous emissions are known to have been lethal to animals at the site (Zimbelman, pers. comm. 1997) but pose little risk to trail hikers passing through the area.

**Cougar Rock Campground.** Overnight use at the Cougar Rock campground is highly hazardous because of its proximity to the volcano and the site's location on a low-elevation debris flow terrace within the case III inundation zone (Hoblitt et al. 1995). The terrace was formed by several debris flows, including the National and Paradise lahars, which inundated this site in the last 5,000 years.

Rockfall is a safety concern at the southwest end of the campground. Cliffs on a ridge descending from Rampart Ridge are producing

large rocks, as identified by an accumulation of talus. Cougar Rock Campground could be threatened by a potential landslide 1.5 miles (2.5 km) upstream on the west side of the Nisqually River at an elevation of 5,600 feet (1,707 m). This slope was undercut by the Nisqually Glacier and is covered with unstable glacial sediments. The landslide was first identified and mapped by Crandell in 1969.

**Paradise.** Park developments in the Paradise area include the Paradise Inn and Annex, Guide House, Henry M. Jackson Memorial Visitor Center, Paradise Ranger Station, a dormitory complex, and a wastewater treatment plant and related facilities. These developments are on the south flank of the volcano at an elevation of approximately 5,260 feet (1,604 m). This location places it less than 6.5 miles (10 km) from the summit crater, but it is located on a bench above the floors of the Paradise and Nisqually Valleys. Paradise is not in any debris flow inundation area mapped by Hoblitt et al. (1995). However, the Paradise lahar did cross the site 4,500–5,000 years ago (Crandell 1971), and its location near the summit makes it one of the most vulnerable sites for volcanic hazards associated with eruptions.

Evacuating this site would continue to be a concern because access roads on both sides cross case III inundation areas. Stevens Canyon is the proposed route (Crandell 1967), although depending on the location of debris flow activity; the road west to Longmire could be safer. Nonvolcanic geologic hazards are a concern in accessing the area through avalanche and rockfall terrain on the Paradise to Nisqually Road.

**Stevens Canyon Entrance.** This area is located in a case II inundation zone. Nonvolcanic geologic hazards, such as rockfall also exist in the Stevens Canyon area.

**Ohanapecosh.** Park developments at Ohanapecosh include a ranger station and

office, a maintenance complex, a visitor center, employee housing, a campground, and a sewage treatment facility. Visitors and park employees are exposed to hazards because the Ohanapecosh developments are located in a case II inundation zone on a series of river terraces and bedrock benches along the Ohanapecosh River (Hoblitt et al. 1995). Nonvolcanic geologic hazards also threaten visitors and employees at the site, primarily the potential failure of the weak rocks of the Ohanapecosh formation on the east valley wall. Hydrothermal alteration and weakening of these rocks probably would continue, as indicated by the presence of the hot springs.

**White River Entrance.** There are hazards in this valley due to the presence of fractured, hydrothermally altered bedrock on Little Tahoma Peak and Steamboat Prow (Zimbelman et al. 1994, 1995; Sisson 1995). This valley carried the Osceola debris flow approximately 5,600 years ago, which inundated this site. The entrance is on a high terrace, which places it in a case II debris flow inundation zone (Hoblitt et al. 1995). Park visitors and employees use this area, which includes a park entrance station, a ranger offices, employee housing, and maintenance facilities. Employee housing in this location is used seasonally, not during winter.

**White River Campground.** This location poses major safety hazards to overnight visitors and daytime visitors because it is located in a case III inundation zone for debris flows (Hoblitt et al. 1995). The hazard is even more significant because the site is very close to the volcano. Also, the campground rests on a terrace only 35 feet (11.5 m) above the White River. The terrace itself is formed by a debris flow deposit believed to be 500–2,000 years old (Crandell 1971). The most important factor for the site is the continued presence of a large mass of fractured, hydrothermally altered rock that is perched just above the campground on Little Tahoma Peak (Sisson 1995; Zimbelman

1995). These rocks are known to be the source of a 1963 debris avalanche that stopped about 3,000 feet (0.6 mile or 600 m) short of the camp after it had already traveled 4.3 miles (7 km; Crandell and Fahnestock 1965).

**Sunrise.** Because it is located on a ridgetop, this site is well above the debris flow hazard zones on the White River valley floor. Park facilities in this area include an entrance station, a ranger station/concession facility, employee apartments, and related facilities. Evacuation by car could be difficult because roads in the White River valley might be inundated by debris flows and could be blocked temporarily; also, the lower part of this road crosses unstable glacial deposits on the lower switchback. As mitigation, visitors would be advised to stay at Sunrise in some types of volcanic emergencies rather than hike out (Crandell 1967). Like Paradise, Sunrise is near the summit and would be very hazardous in volcanic eruptions.

**Mowich Lake.** The ridgetop location of this site places it well above the valley floor where debris flows could occur. Evacuation of this site by car could be temporarily blocked by debris flows affecting roads in the Carbon River valley (Crandell 1967).

**Carbon River .** The Carbon River headwaters rise in an area on Mount Rainier composed of more recent, less hydrothermally altered rocks than other valleys, such as the White and Puyallup Valleys (Zimbelman 1995). Therefore, debris flow hazard would continue to be somewhat less. Park facilities in this area include an entrance station, a district ranger station, and associated storage and maintenance facilities.

Visitors and park employees are exposed to hazards because the Carbon entrance facilities would remain on a low terrace adjacent to the Carbon River floodplain in a case II inundation zone (Hoblitt et al. 1995). The Ipsut Creek campground is on a low terrace less than 6 feet

(1.8 m) above the floodplain of the Carbon River in a case III debris flow inundation zone (recurrence interval of less than 100 years; Hoblitt et al. 1995). The risk may be less at this site than other sites in a case II or III inundation zone because the watershed is headed by rocks that are less hydrothermally altered than in other valleys.

A preliminary floodplain study conducted by the park (NPS 1997b) determined that the Ipsut Creek campground is located in a high flood hazard zone. Detailed studies concluded that portions of the campground occupy very low

parts of the floodplain, and high flood hazard occurs in this area at discharges of 1,000 cubic feet per second. The detailed modeling also determined that most of the campground is outside the 100-year floodplain.

However, it is anticipated that continued deposition in the modern channel and upstream channel alignment will cause the Carbon River to shift to the south, isolating and claiming all or parts of the campground and causing considerable damage to roads, trails, and other facilities.

## CULTURAL RESOURCES

### ARCHEOLOGICAL RESOURCES

Mount Rainier's dense forests, extensive glaciation, volcanic deposition, and catastrophic debris flows have contributed to conditions that are not conducive to the preservation or ready identification of archeological resources. Until recently archeological surveys focused either on areas possessing a good probability for sites (e.g., natural features such as rock overhangs) or on specific areas that were scheduled to be altered by development activities, thus meeting cultural resource protection requirements.

Mounting archeological evidence has reversed long-held assumptions that prehistoric people seldom visited Mount Rainier or that they restricted their activities to lower elevation stream and river courses. Recent site discoveries within subalpine and alpine settings (above 5,000 feet on all sides of the mountain) indicate more widely distributed patterns of use (Burtchard et al. 1998). Ethnographic and historical accounts of Native American seasonal visits to high elevation locations lend further support to the archeological evidence.

At least 3,400 years ago, and perhaps as early as 8,500 years ago, when Mount Rainier became ice-free, small groups of prehistoric hunters and gatherers procured fruits such as huckleberries; a variety of mammals, including mountain goats, elk, deer, and marmots; and other resources at higher montane elevations. Subalpine and alpine habitats characterized by limited forest cover and grass/brush vegetation, supported an abundance of useful plants and animals that were available during the mountain's brief summers.

A 1995 parkwide archeological reconnaissance survey is the most comprehensive investigation to date (Burtchard et al. 1998). Archeologists reexamined five previously reported sites and

investigated a variety of accessible landforms, over approximately 3,550 acres in the park. Fourteen previously unrecorded archeological sites were documented, bringing the total to 22 recorded sites: 20 prehistoric sites (four with historical components), two historic sites, and 18 isolated finds. From 1995 to 1999, smaller scale research and compliance surveys increased the total to 54 archeological sites and 31 isolated finds.

For the most part, the park's prehistoric sites and isolated finds are low-density scatters of lithic material consisting of projectile points, tools, and flakes discarded from the manufacture of these objects. The artifactual remains are associated with a range of activity areas, including hunting camps, butchering and processing sites, rock shelters, and lithic procurement or quarry sites. Rock shelters have proven to be among the more complex and significant sites, as demonstrated by test excavations of the Fryingpan and Berkeley Park rock shelters and Sunrise Ridge. Evidence recovered from these stratified sites supports the likelihood that they served as seasonal hunting camps on multiple occasions from approximately 2,000 to 3,000 years ago. It is likely that additional testing would provide data indicating earlier periods of occupation.

Archeological sites are important to contemporary Native Americans. Such sites have historic and present-day values for tribes traditionally affiliated with the park.

Because less than 2% of the total land area in Mount Rainier National Park has been systematically surveyed, the number of documented archeological sites is expected to increase as a result of future investigations. Historic archeological resources (currently underrepresented compared to documented prehistoric resources) are among the sites anticipated to add to the park's growing inventory. These

sites will be associated primarily with late 19th and early 20th century mining, lumbering, recreation, and park development activities. They will commonly consist of camps, trash dumps, collapsed structures, utility systems, and scattered debris.

## **ETHNOGRAPHIC RESOURCES**

Ethnographic resources are defined as landscapes, sites, structures, objects, or natural resource features that have significance due to importance attached to them by members of a sociocultural group associated with the park (NPS 1997a). Although the park contains numerous ethnographic resources, none have been evaluated for listing on the National Register of Historic Places as traditional cultural properties. The national historic landmark district was established on the basis of the integrity of the early park design — its road corridors and structures, not its archaeological or ethnographic sites.

For thousands of years, Mount Rainier has been an important place and a symbolic landmark for Pacific Northwest Indian cultures. Mount Rainier falls within lands ceded by three treaties and contains ancestral hunting grounds of the Nisqually, Muckleshoot, Cowlitz, Puyallup, Yakama, and perhaps other modern tribes. Although no evidence of permanent habitation has been verified within the park boundary, it is clear from early park records and studies that small groups historically hunted deer, elk, mountain goats, marmots, and grouse up until 1916. Yakima Park and Indian Henrys Hunting Ground were well known for this purpose. After 1916 the park's establishing act (1899) and the National Park Service Organic Act (1916) prohibited hunting in the park (Boxberger 1998).

In addition to hunting uses, archaeological and ethnographic evidence suggest that historic people used high elevation subalpine and alpine landscapes on Mount Rainier to gather a

variety of economically important resources like huckleberries and wood products. Gathering beargrass and cedar splits for basketry and collecting plants for medicinal, ceremonial, and religious uses continued until 1950 (Boxberger 1998).

Trails and travel routes were established to access gathering sites and facilitate trade across the mountain. Although evidence of use is limited, meaningful historic use of the Huckleberry Creek Trail, the Sunrise area and the Cowlitz Divide is likely. Traces of these routes are still distinguishable but require further study. Through recent consultations with the tribes, it has been established that gathering still takes place; however, exact locations and specific sites have not been well documented. Partial knowledge of historic and traditional trails, including a sea-to-mountain route up the Nisqually River, warrants further investigation to verify. The park staff is in active consultation with the tribes to better manage traditional tribal uses in the park.

At least five contemporary descendant Native American tribes — Nisqually, Muckleshoot, Puyallup, Yakama, and Cowlitz — are still associated with traditional uses of Mount Rainier. These tribes evolved from a broader regional ancestry that traded goods and intermarried, yet retained political and linguistic distinctions. The Yakama Indians are a confederated nation occupying lands adjacent to the eastern side of the mountain. The Muckleshoot, Puyallup, Nisqually, and Cowlitz inhabit areas north, west, and south of the park along rivers that drain to the Puget Sound or the Columbia River and support viable fisheries.

## **HISTORIC RESOURCES**

The park has approximately 158 historic resources (including buildings, structures, and objects) on the National Register of Historic Places. Many more sites, structures, and objects are potentially eligible. In addition to

the comprehensive national historic landmark district (described below), which was designated for the cultural landscape significance of the park's early development period, the following architecturally significant historic districts were established in 1991:

- Nisqually Entrance Historic District
- Longmire Historic District
- Paradise Historic District
- Camp Muir Historic District
- White River Entrance Historic District
- Sunrise Developed Area Historic District.

Each of these historic districts exhibits significant examples of NPS "rustic" architecture in the style of the period of its development. In addition, several national historic landmark buildings in the park have been individually designated: Longmire Community Building, Longmire Service Station, Longmire Administration Building, Paradise Inn, and the Sunrise Blockhouses/Stockade Complex.

### **Mount Rainier National Historic Landmark District**

Most developed areas of Mount Rainier National Park are included in a comprehensive national historic landmark district that was designated in 1997 (see the National Historic Landmark District map). The district was created in recognition of the national significance of Mount Rainier in the history of American park planning and design, and the development and implementation of the national park idea in the early half of the 20th century. The period of significance for the district is 1904 to 1957. The national historic landmark district recognizes the importance of Mount Rainier National Park as an example of national park "master planning." The historic master plan for Mount Rainier, finalized in 1929, was the first and most complete national park master plan to be developed by the

National Park Service. Master plans were subsequently developed for almost every national park and national monument in the late 1920s and early 1930s.

The physical integrity of the developed areas and facilities of Mount Rainier also set it apart from other national parks. As a whole, no other collection of park roads, bridges, developed areas, and trails is more completely preserved as an intact example of national park planning and design of the period. The boundaries of the national historic landmark district form a contiguous corridor that overlies the park's road system. This historic corridor connects and includes all major developed areas of the park, as well as the Wonderland and Northern Loop Trails and the two spur entrance roads in the northwestern corner of the park. Most of the Longmire, Paradise, and Sunrise areas are included in the district, as are other roadside features, including entrance gates and stations, overlooks and parking areas, roads, bridges, and trails.

The national historic landmark district also includes noncontiguous areas (in the wilderness) such as wilderness cabins, shelters, and fire lookouts. Of the 188 buildings, structures, and objects within the national historic landmark district, 158 retain integrity and are contributing elements to the district's historic significance (see Mount Rainier National Register registration forms, NPS 1997d).

The description of the Mount Rainier National Historic Landmark District is divided into the following six categories of contributing resources.

- *Spatial organization* — the composition and sequence of outdoor spaces within the district.

National Historic Landmark District  
**map**

AFFECTED ENVIRONMENT

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- *Circulation* — the means and patterns of movement through the district.
- *Topography* — the ways in which the landscape planning responds to the topographic features of the site and to modifications of that topography.
- *Vegetation* — refers both to the response to existing vegetation and to the management of vegetation through the pruning, removal, or addition of trees and shrubs.
- *Structures* — all contributing structures in the district, such as roads, trails, and retaining walls.
- *Buildings* — structures intended to shelter a human activity.

These contributing resources may be referred to collectively as the historic cultural landscape of the district. All of these resources are considered together as a single cultural landscape that incorporates the majority of the park's nonwilderness areas, as well as certain wilderness areas. The designation as a national historic landmark district recognizes that Mount Rainier National Park does not simply contain certain individual historic resources (such as historic buildings), but is itself a historical park. The historic roads, trails, buildings, and designed landscapes of Mount Rainier together comprise a cultural landscape of national significance in American history.

**Roadside Character.** The park roads that contribute to the national historic landmark district are Nisqually to Paradise road, Paradise Valley Road, Westside Road, Stevens Canyon Road, Eastside Highway (State Route 123), Mather Memorial Parkway (State Route 410), White River to Sunrise Road (Yakima Park Highway), Mowich Lake Road, and Carbon River Road. The park roads were designed to minimize the visual and environmental impacts of construction. This led to a special concern for the preservation of roadside vegetation and the minimal disturbance of the road corridor during excavation and grading operations.

Trees were often preserved right up to the paved surface of the roadway. "Rustic" construction details, including several distinct types of crenellated masonry guardwalls, were handcrafted of native stone, often salvaged from adjacent roadway cuts. This practice achieved a unique match between the color and texture of the masonry and the appearance of the exposed stone faces of road cuts. Concrete bridges typically were veneered in masonry to match the masonry construction of guardwalls and retaining walls. Where culverts could be used to handle drainage, the same native stone was used to build masonry headwalls, concealing outfall culverts of steel or concrete.

Scenic pullouts, or overlooks, are especially significant aspects of the park road system. They often include curbs, guardwalls, and other typical roadside structures. They are usually located to take advantage of particular views or natural features, and in some cases they also provide convenient parking for trailheads. They sometimes are defined by a continuation of the road guardwall, and in other cases they are no more than widened areas of the road. More elaborate roadside areas, such as those at Christine Falls, Narada Falls, and Tipsoo Lake, qualify as minor developed areas in the park and may include short trail networks or some visitor facilities.

Necessary roadside structures, including park gates, signs, and interpretive displays, like masonry guardwalls and other roadside construction, were carefully designed elements of the roadside landscape. Park managers were aware that the roadside often formed the foreground for visitors' views of park scenery. For most visitors, even in the 1920s, the view from the road was a principal means of experiencing the park landscape. Roadside vegetation was managed to ensure that important views would not be obscured. Park signs and structures were carefully sited and designed to avoid competing with, obscuring, or degrading views of scenery and natural features.

**Historic Vehicular Circulation.** The historic vehicular circulation pattern in Mount Rainier National Park is of great importance to the national historic landmark district. To a large degree, the means and pattern of vehicular traffic through the park help to determine the sequence and content of a visitor's experience of the park.

The road system of Mount Rainier suggests a modification of a typical park loop drive system that was popular in early park planning schemes. At the turn of the century, Army engineer Hiram M. Chittenden favored a "round-the-mountain" loop road as a basis for the overall development plan of the park, but this essentially 19th century approach to national park development never fully materialized at Mount Rainier.

In the late 1920s, NPS officials established important precedents at Mount Rainier for limiting the total amount of highway construction deemed appropriate for national parks. The park's abbreviated vehicular circulation diagram, approved by Horace Albright in 1929, was an important step back from the round-the-mountain scheme. The new diagram, which continues to define the visitor experience today, describes a great loop from the Seattle/Tacoma area through the park and back. Visitors could travel the Mountain Highway to the park and go on to Longmire and Paradise on the Nisqually to Paradise Road. From Paradise, the Stevens Canyon Highway would make it possible to reach the southeast corner of the park and from there return home via the Eastside Highway (State Route 123) and the Mather Memorial Parkway (State Route 410), completing a great loop. Rather than going round-the-mountain, only the southern and eastern sides of the mountain were traversed by the main travel corridors of the planned road system.

Other roads, including Westside Road and Yakima Park Highway, would remain cul-de-sacs and therefore side trips. The northern

slopes of the mountain would never be accessible by road. This important change in the overall park plan reflected an evolving sense of how much road development would be considered appropriate for national parks in the future.

### **Henry M. "Scoop" Jackson Memorial Visitor Center**

The Henry M. "Scoop" Jackson Memorial Visitor Center at Paradise, completed in 1966, was named for Washington Senator Henry M. "Scoop" Jackson, who was instrumental in securing congressional funding for its construction. The building was built as part of the National Park Service's design and construction initiative known as "Mission 66," a 10-year nationwide program begun in 1956, to alleviate the pressures on park facilities and infrastructure resulting from the dramatic upsurge in visitation after World War II. Mission 66 designers incorporated the use of modern building materials and design elements in building construction (concrete and prefabricated components, large plate-glass windows, and open interior spaces) as well as functionally integrating facility designs to efficiently address the circulation needs of the motoring public.

The Honolulu-based architectural firm of Wimberly, Whisenand, Allison and Tong collaborated with the Tacoma, Washington, firm of McGuire and Muri to design the visitor center. Distinctive design features included its round configuration and conical roof, intended to relate the building to its mountain setting (NPS 1996f). Because of its unique design, the "Scoop" Jackson Visitor Center received a fair amount of attention in its early days, having been publicized in various design and other magazines of the time. It is also believed to have been the most costly visitor center constructed as part of the Mission 66 program (Carr 2000). Considerable controversy was stirred among historic preservationists and others when an adjacent historic building, the

Paradise Lodge, was burned to clear an area for the visitor center parking lot.

The visitor center is not included within the boundaries of the Mount Rainier National Park

National Historic Landmark District and is not a contributing element to its historical significance.

## VISITOR EXPERIENCE

### VISITATION

Mount Rainier National Park is one of the most popular visitor attractions in the Pacific Northwest. In 2000, there were 1,970,406 visits. As shown in table 12, the number of visitors to the park has varied little over the last 11 years. The highest visitation in the past decade was 1992, with 2,358,296 visitors.

Attendance is highly dependent on regional weather conditions. Visitors are drawn to the park from the surrounding region when the weather is clear and the mountain is visible, particularly on weekends. Visitation figures may also be affected by other external factors, such as road construction or flood damage on major access routes, or may vary due to changes in methods of counting visitors.

Although table 12 shows about a 20% drop in visitation from 1994 to 1999, a long-term (30+ years) trend analysis shows park use levels increasing over time. Despite the variations in visitation figures from year to year, the underlying trend has been one of a minor increase. Most of the sharp decreases in use levels in the table from year to year have been primarily due to weather conditions. For example, record rains in western Washington in 1995–1996 closed the Carbon River area to vehicles, delayed the opening of the Mowich Lake area, and closed State Route 123 for portions of the season. Similarly, a huge snowpack in 1998–1999 resulted in delays in opening roads and trails, which lowered visitation levels.

**TABLE 12: MOUNT RAINIER NATIONAL PARK VISITATION, 1989 THROUGH 1999**

Year	Total Visits	Number of Visits in July and August	July–August Visits as Percentage of Annual Visits
1989	2,012,900	844,989	42%
1990	1,936,215	860,716	44%
1991	2,235,591	1,049,379	47%
1992	2,358,296	927,227	39%
1993	2,192,062	994,928	45%
1994	2,206,083	1,065,567	48%
1995	2,181,396	870,509	40%
1996	1,868,525	1,007,347	54%
1997	1,820,481	955,207	52%
1998	1,901,301	861,280	45%
1999	1,764,091	781,427	44%

Visitation begins to increase in spring, peaks in July and August, and decreases substantially beginning in October. Visitation during the peak season (June through October) has regularly approached and sometimes exceeded 1 million visitors. Typically, visitors during the peak months (July and August) represent at least 40% and, sometimes, over half of the total annual visits.

Table 13 illustrates the monthly visitation averaged for 1998 and 1999. During August 1998 and 1999, an average of 14,151 visits were recorded each day. In contrast, during

**TABLE 13: AVERAGE MONTHLY VISITATION  
1998 and 1999**

Month	Number of Visitors
January	27,883
February	23,819
March	27,531
April	37,824
May	96,125
June	198,975
July	382,664
August	438,689
September	303,959
October	196,735
November	69,308
December	29,180

February 1998 and 1999, use averaged only 850 visits per day. To some degree, the figures for the last several years at Carbon River are reduced due to continued flooding-related road closures. During winter, State Route 410, much of State Route 123, the road to Mowich Lake, and the Stevens Canyon Road are closed. Along with more limited recreational opportunities during winter, this account for the lower visitation compared to summer. Visitor use, however, remains high in the winter in proportion to the available winter recreation facilities.

Day use is the predominant form of visitation at Mount Rainier. According to 1993 annual visitation statistics, 38% of all overnight visitors stay in campgrounds, 30% in concessioner lodging facilities, 29% in the wilderness, and 3% in miscellaneous public facilities. Based on visitor surveys, average overnight stays were 2.1 nights at wilderness campsites, 2.5 nights at drive-in campgrounds, and 1.6 nights at an inn or lodge. Visitor surveys show approximately the same amount of overnight use in nonwilderness campgrounds and wilderness campsites.

### VISITOR PROFILE

Visitors come to Mount Rainier from all parts of the nation. According to a 1990 survey conducted in the park (Johnson et al. 1991), approximately 59% of park visitors were residents of the state of Washington. Of these residents, approximately 44% were from the surrounding counties of King, Lewis, Pierce, and Yakima. Other visitors were from California (5%), Oregon (3%), foreign countries (3%), and other U.S. areas (30%). Approximately two-thirds of all visitors indicated that the park was their primary destination. More than half of all visitors said they did not have a planned primary destination within the park, but 71% stopped at Paradise during their visit.

Even though the park is near the large metropolitan areas of Tacoma/Seattle (1.5 hours), Yakima/Tri-Cities (2 hours) and Portland/Vancouver (2.5 hours), the visitor population does not reflect the ethnic diversity of these areas. Visitors to the park are approximately 95% Caucasian, 3% Asian / Pacific Islanders, 1% African-American, and 1% Native American / Alaskan, as documented by a 1990 visitor use survey (Vande Kamp and Johnson 1990).

Most visitors tend to be educated, are employed in professional positions, and their average age is 43. A high proportion of visitors

are retirees over the age of 60. The majority of visitors (64%) come with family members and many (30%) are accompanied by children under the age of 16 (Johnson et al. 1991).

## VISITOR ACCESS

### Access to the Park

Each roadway leading into Mount Rainier National Park is a paved two-lane road, with the exception of the Mowich Lake road, which is a two-lane gravel road. Park roads are characterized by moderate speeds along rolling, steep, mountainous terrain. Reasonably straight segments, moderate grades, and some winding curves and narrower segments can be found along the entrance routes as visitors approach the park. Even though the routes provide adequate capacity for traffic approaching the park, congestion occurs at park entrance gates during high use days, when people stop to pay fees or ask for information.

Access to the south part of the park is available via State Route 123, which enters the park near the southeast corner and gives access to Ohanapeosh and the Stevens Canyon entrance. State Route 123 connects to U.S. Highway 12, 5 miles outside of the park's southern boundary. U.S. Highway 12 offers access to Yakima to the east and additional access to Mount Rainier from population centers to the southwest. Travel between Mount Rainier and the eastern portion of Mount St. Helens National Volcanic Monument is accommodated by the connection to U.S. Highway 12.

The main access to the south area of the park from the west is via State Route 706. It travels through the gateway community of Ashford, approximately 7 miles outside the Nisqually entrance. State Route 706 connects to State Route 7, a principal north-south highway in the Puget Sound region, about 14 miles west of the park at Elbe.

Forest Service Road 52, which parallels the southern boundary of the park and intersects State Route 706 approximately 3 miles west of the Nisqually entrance, provides a connection between the gateway communities of Packwood and Ashford during summer. The road, which has recently been upgraded with new bridges and pavement, is an alternative travel route between the east and west sides of the park. The improved roadway along this route may reduce some through travel on park roads between the Stevens Canyon and Nisqually entrances.

Washington State Route 165 through the gateway communities of Buckley, Wilkeson, and Carbonado leads to Mowich Lake in the northwest portion of the park. A branch from State Route 165 south of Carbonado gives access to the Carbon River entrance. No connections are available between these roads in the park, and there are no connections with other internal park roadways to get to the south or northeast areas of the park.

Access to the northeast area of the park is via State Route 410 (Mather Memorial Parkway), which passes through Enumclaw and later, Greenwater, approximately 14 miles from the north park boundary. Travelers can reach State Route 410 via Interstate Highway 5 or I-405 to State Route 169 (from Seattle), or by State Route 167/164 (from Auburn) or State Route 167 (from Tacoma).

Travelers coming from the east can reach Mount Rainier on State Route 410. From the east park boundary at Chinook Pass, State Route 410 extends approximately 51 miles to a connection with U.S. 12, which leads to Yakima, approximately 70 miles from the park.

### Access within the Park

The park has five primary entrance locations. The Nisqually and Stevens Canyon entrances

serve the southern part of the park, the White River entrance provides access to the northeast part, and the Carbon River and Mowich Lake entrances enter the northwest area. The highways leading into Mount Rainier National Park connect to the internal park road system at these entrances.

Within the park the following primary facilities are all paved roadways and are the main routes used by most visitors:

- Nisqually to Paradise Road — west park boundary (Nisqually entrance) to Stevens Canyon Road (16 miles) and to Paradise (18 miles)
- Stevens Canyon Road — Nisqually to Paradise Road to the Stevens Canyon entrance at State Route 123 (19 miles)
- State Route 123 — South park boundary (near Ohanapecosh) to State Route 410 (14 miles)
- State Route 410 (Mather Memorial Parkway) — east park boundary (Chinook Pass) to north park boundary (12 miles)

Through a cooperative agreement between the National Park Service and the Washington State Department of Transportation, the state maintains State Route 410 and State Route 123 within the park boundary. As part of the legislation that predated this agreement, state route numbers are used on the east side of the park. The park maintains all other roads, including the Nisqually to Paradise road, Paradise Valley Road, Stevens Canyon Road, White River Road, Sunrise Road, Carbon River Road, and Mowich Lake Road. Additional transportation facilities maintained by the park include a series of spur roads, loop roads, access drives, administrative and utility access roads, and parking areas.

The parkwide road system does more than facilitate travel to specific locations. The

roadways in Mount Rainier provide scenic vistas for travelers and enhance visitor's enjoyment of the park. Turnouts and viewpoints are located along the roadway system for sightseeing. The road system provides visitor access to developed areas and to numerous trailheads, where visitors may undertake short or extended walks into the park's extensive wilderness.

**Access in the South Area.** The Nisqually to Paradise Road (State Route 706 outside park boundary) begins at the park boundary, passes through Longmire, and connects to Paradise Valley Road and Stevens Canyon Road. The Nisqually to Paradise Road is open year-round (except for temporary closures due to heavy snowfall or other extreme winter weather conditions). Paradise Valley Road is a single lane, one-way (southbound) paved road that is part of a loop route from the Nisqually to Paradise Road, through Paradise to Stevens Canyon Road. Paradise Valley Road is open only in summer. Stevens Canyon Road leads from the Nisqually to Paradise Road through Stevens Canyon to an intersection with State Route 123 just east of the Stevens Canyon entrance station. It provides access to Narada Falls, Paradise, Reflection Lake, Box Canyon, and the Grove of the Patriarchs, as well as a variety of trailheads. This roadway is maintained for summer use only and may be used as a through route with other major park roads — the Nisqually to Paradise Road, State Route 123 and State Route 410.

State Route 123 extends into the park from the south, serving the Ohanapecosh activity area. It intersects with Stevens Canyon Road just inside the south boundary and extends north to an intersection with State Route 410 (Mather Memorial Parkway) at Cayuse Pass. It is open north of Ohanapecosh only in summer, when it can be used as a through north-south route in combination with State Route 410.

Westside Road is an unpaved, two-lane road that intersects the Nisqually to Paradise Road

approximately 1 mile inside the west park boundary and extends approximately 13 miles north along the west boundary to Klapatche Ridge. Due to recurring glacial outburst flood damage, the road has been closed for many years at Dry Creek, approximately 3 miles from the intersection with the Nisqually to Paradise Road.

**Access in the Northeast Area.** State Route 410 is the principal route to the park from the north and the only access to the park from the east. It extends from the east park boundary at the summit of Chinook Pass west to Cayuse Pass and then north to the north park boundary. From State Route 410, access to the White River area is available by White River Road, which intersects State Route 410 about 5 miles south of the north park boundary. The Sunrise road, extending north and west from White River Road, provides access to the Sunrise area. All roads in the northeast part of the park are closed in winter.

**Access in the Northwest Area.** The winding road leading to Mowich Lake from the park boundary (it is State Route 165 outside the park) is unpaved and passes through forested terrain. Roadway grading is required after the snow melts each season to prepare the road for opening. Dusty conditions are typical along much of the roadway throughout the summer. The road is not plowed in winter.

Carbon River Road, which extends from the Carbon River entrance at the northwest corner of the park to the Ipsut Creek campground, has a slight uphill grade and is paved for less than 0.5 mile within the park. A limited number of pullouts are available for passing vehicles. Portions of the road lie within the floodplain of the Carbon River. Floods have damaged the road in the past, and intensive maintenance is required to keep the road open. The road is not plowed, although it is open to vehicles in winter (except for temporary closures during extreme weather conditions).

The Carbon River and Mowich Lake roads do not connect to other park roads or to other activity areas in the park.

**Travel Distribution Patterns**

Of the five entry points to the park, the Nisqually entrance provides the most convenient access to Paradise from much of the Puget Sound urban area and consequently receives the highest number of visitors. Open year-round, the Nisqually entrance serves a large majority of winter park visitors. State Route 123 also provides year-round access to the Ohanapecosh area and, in summer, to the Stevens Canyon entrance. However, annually, fewer visitors use the Stevens Canyon entrance than the Nisqually entrance. The White River entrance is open only from spring to fall, mainly serving visitors on their way to Sunrise. The Carbon River and Mowich Lake Roads serve fewer visitors than the three main entrances described above.

Traffic counter data are collected at the Nisqually, Stevens Canyon, White River, and Carbon River/Mowich Lake entrances, as well as at Paradise. A comparison of peak season traffic counts at the four main park entrances on weekends is shown below:

Nisqually-----	46%
Stevens Canyon -----	20%
White River -----	23%
Carbon River/Mowich -----	11%

Traffic samples and visitor surveys indicate that many park visitors use more than one park road during their stay and may enter and exit the park at different locations. During a visitor survey (BRW, Inc. 1995), 43% of the sampled vehicles entering at Nisqually exited the park at Stevens Canyon, while only 35% of the vehicles that entered at Stevens Canyon made a through-trip out the Nisqually entrance. Overall, about 60% of all vehicles exited the

southern part of the park at the same location that they entered.

In a 1993 study, the highest weekend daily traffic volumes (5,155) were found near Paradise (BRW, Inc. 1995); however, these volumes may have included vehicles that were double counted while circulating around the Paradise area when the parking lots were full. The next highest weekend daily volumes were at the Nisqually entrance. The weekend daily two-way average was nearly 5,000 vehicles, which is approximately double the weekday average. August weekend daily traffic volumes on the other major park roads ranged from a high of 4,900 along State Route 410 north of White River Road to a low of 635 on Mowich Lake Road.

### Transportation Services

Limited transportation alternatives to private vehicles are available for access to Mount Rainier. An employee shuttle runs between Eatonville and Tahoma Woods or Longmire, occasionally with two schedules. Rainier Mountaineering, Inc., also provides shuttle service to Paradise for climbers.

Gray Line of Seattle offers commercial tour bus service between Mount Rainier and the Seattle/Tacoma urban areas. Most patrons of Gray Line take a round-trip tour of the park and the surrounding area, remaining with the tour bus. Limited use of the service is made for one-way trips. Two to three round trips are made per day during the peak season, and an overnight excursion is available featuring a stay at the Paradise Inn. All trips travel through Sunrise, Cayuse Pass, Box Canyon, Stevens Canyon, and Paradise. During the peak season, travel by tour bus accounts for approximately 2%–3% of all vehicle trips into Mount Rainier.

### Parking

Parking facilities serve developed areas, trailheads, and viewpoints. Visitor demand for

parking is greatest on sunny weekends during the summer, when parking at all of the major visitor areas throughout the park is congested for at least part of the time. During these times each major activity area experiences parking capacity and vehicular circulation conflicts. Some parking areas at trailheads are filled to capacity on busy days.

**Longmire.** Typically, the Longmire parking area is congested between noon and 6 p.m. on sunny summer weekends. Visitor vehicle parking tends to spill over into designated bus and RV spaces, and unauthorized visitor parking occurs along travel lanes and in administrative parking areas. A parking survey conducted on a peak summer weekend day in 1993 found the Longmire parking lot to be over capacity for about five hours (BRW, Inc. 1995).

**Paradise.** The Paradise area receives the greatest visitor use of any area in the park. The trails beginning at Paradise are the most heavily traveled at Mount Rainier, and most summit climbs begin at trailheads in the area. The area also is a popular site for viewing wildflowers and scenic vistas. Some of the best and most easily attained views of Mount Rainier are from Paradise. Because of its popularity, and because of the limited size of the parking area, Paradise experiences parking shortages during busy days in the summer.

The main visitor parking lot is within the historic district area that includes the Paradise Inn and its associated buildings, the Guide House, the ranger station, the Plaza Comfort Station, and other related buildings. The parking lot is at the base of the famous subalpine meadows and is nestled into the hillside, which gives visitors a unique feeling of being almost part of the mountain. A smaller parking lot is located near the Henry M. Jackson Visitor Center. The parking capacity at Paradise is approximately 756 spaces, but based on a 1993 survey, parking use reached 1,270 vehicles and exceeded capacity for a period of six hours on

one of two peak weekend days measured (BRW, Inc. 1995).

A shortage of bus and RV spaces results in inefficient use of available parking spaces. In addition,, employees and visitors must use the same parking spaces. Spaces at the Paradise Picnic Area, 0.5 mile away, are extensively used as overflow parking on busy days, and overflow parking occurs along the access roads, causing congestion and pedestrian-vehicle conflicts. Visitors park as far as 1 mile down Paradise Valley Road from the Paradise area, resulting in inconvenience to visitors and creating an auto-dominated experience for some.

**Ohanapecosh.** Only 12 parking spaces are available adjacent to the Ohanapecosh visitor center. Visitors often have to park in less convenient spaces a short distance away at the ranger station. An additional day-use parking lot with 11 spaces is often full.

**Sunrise.** Visitor use at Sunrise requires the use of overflow gravel areas for parking on busy summer weekend days. Park staff must direct traffic and guide visitors to available parking spaces. A lack of defined pedestrian paths within the parking areas creates pedestrian-vehicle conflicts. There are about 260 designated parking spaces at Sunrise and 340 overflow spaces in the gravel area. Overcrowding on peak season weekends is common throughout the day. During the 1993 survey the overflow parking, measured on a peak weekend day, was in use from noon until after 6 p.m. (BRW, Inc. 1995).

**Mowich Lake.** Visitation on busy summer weekends creates parking demand well beyond the 50 spaces available at the gravel parking area that serves the Spray Park trailhead and Mowich Lake campground. Overflow parking occurs along the roadway up to 0.5 mile from the lake. Dust and congestion frequently occur as vehicles circulate along the dead-end road when the parking area is full. The long walk

from the overflow parking areas to the lake creates inconvenience for visitors.

**Ipsut Creek Campground and Trailhead.**

Carbon River Road provides access to the Ipsut Creek trailhead and campground area. The 80-space parking area serving the campground and trailhead is typically full on busy summer weekends. Visitors park along the narrow roadway, creating conflicts with traffic flow and threatening sensitive roadside resources.

Most winter visitor use takes place at the Paradise area, reached via the Nisqually to Paradise Road. Traffic congestion and overflow parking occurs on weekends at the snow gate at Longmire. Vehicles waiting for plowing operations to clear the roadway may create overcrowding in the Longmire parking area, and traffic may back up along the road through the Longmire area. At the Paradise area, haphazard visitor parking can become a problem in the existing lots. Snow play activities near the roadway and parking area also create pedestrian-vehicle conflicts.

**PRINCIPAL VISITOR OPPORTUNITIES**

The setting of Mount Rainier is one of the most scenic and historically significant areas in the West. At lower elevations, the mountain is clothed in old-growth forests of Douglas-fir, western red cedar, and hemlock. The glaciers that crown the mountain make up the largest such system in the lower 48 states, and the peak itself is both the tallest volcano and the fifth highest peak in the continental United States.

Just above timberline, Mount Rainier's sub-alpine meadows are famous for seasonal displays of flora that are appreciated by many park visitors. The spatial organization of the park is based on a sequence of major and minor developed areas interspersed along the park's main road system. Most visitor services,

accommodations, and administrative areas are concentrated within these developed activity areas. The vast majority of the park (97%) is designated wilderness, and aside from historic wilderness structures, it remains free from the encroachment of facilities.

### Primary Visitor Destinations

The areas with the highest summer day-use visitation levels are Paradise, Sunrise, Longmire, Ohanapecosh, Carbon River, and Mowich Lake. Overnight stays are concentrated at the historic inns at Longmire and Paradise; at nonwilderness campgrounds (at Sunshine Point, Cougar Rock, Ohanapecosh, White River, Ipsut Creek and Mowich Lake); and at trailside camps in the wilderness.

During peak-use periods between July and September, visitors may experience crowded facilities, congested parking lots, and densely populated activity and recreational areas at these popular destinations, especially on sunny weekends and holidays. A survey of visitors at the park's major visitor facilities found that wait times at major facilities were not significant to visitors' enjoyment of the overall experience. Wait times at the Jackson visitor center's lobby, restaurant, gift shop, and bookstore also did not significantly affect visitors' overall satisfaction with the trip (Vande Kamp and Johnson 1998).

A social indicators survey conducted in 1996 found that visitor enjoyment at various destinations in the park was impacted by two major factors, traffic congestion and parking availability (Vande Kamp 1996). These factors had a significant effect on the overall visitor experience. The same survey also found several other factors to be significant in determining the quality of the visitor experience as it related to destinations in the park. In order of importance, these factors were as follows:

- the availability of park information

- the availability of self-guiding trails
- the number of vehicles visible in parking lots
- the number of vehicles visible on roads

**Longmire.** Longmire, a nonwilderness visitor activity area, is often the first major developed area that Nisqually entrance visitors encounter. The Longmire administration building, the National Park Inn, the former Longmire service station, and the historic Longmire Museum define the area. These structures identify the Longmire area as a focal point for the public. In addition to these structures, Longmire offers a historic walking tour, a historic interpretive trail, and the Trail of the Shadows, which takes visitors to mineral springs located in the nearby meadows and forest. The Eagle Peak and Wonderland trails are also accessed from Longmire.

Longmire provides year-round services and facilities, and because of its historic and developed nature, it tends to offer visitors a socially active experience. Many visitors make relatively short stops here to obtain information and to take care of personal needs. The average visitor stay is less than 1.4 hours; more than half of the visitors spend only 30 minutes or less (BRW, Inc. 1995).

In winter the Longmire area is used for short visits en route to Paradise. It also serves as a waiting area for visitors who arrive before the road is opened at the Longmire snow gate. On mornings following heavy snows (typically from 4 to 36 inches), the opening of the road can be delayed by plowing operations along the roadway at the Paradise parking area and by avalanche conditions. The road may be opened any time between 7 a.m. and 1 p.m., and occasionally it is not opened at all. On snowy winter days, visitors endure long waits with few opportunities, and Longmire can become overcrowded.

**Paradise.** Paradise is a nonwilderness area characterized by subalpine terrain and a network of hiking trails that attract high levels of visitation. The main road to Paradise takes the visitor to the Henry M. Jackson Visitor Center, which features interpretive exhibits along with films and slide programs on animals, glaciers, geology, wildflowers, and natural features of the park, as well as food services. The Paradise guide house and ranger station serve as the starting point for climbers on the south summit routes, including independent climbers and those using guide services.

The trail network of the Skyline Trail (including the Golden Gate, Alta Vista and Glacier Vista Trails) and the Nisqually Vista self-guiding interpretive trail offer treks through old-growth forests and views of glaciers and subalpine and alpine habitats. Visitors to Paradise experience a high degree of social interaction while seeking information on the trails, going to visitor centers, picnicking, and camping. During peak summer weekends, the visitor experience on the wilderness trails near Paradise is influenced by the large number of people using the area. Observations in 1993 (BRW, Inc. 1995) showed that visitors spend an average of two to three and a half hours visiting Paradise in the summer. Based on the park Visitor Distribution Survey (Vande Kamp et al. 1997) the peak hourly number of visitors on the Deadhorse Creek Trail and the Skyline Trail were 256 and 198 people, respectively.

Paradise is the primary winter destination for visitors to Mount Rainier. The Nisqually to Paradise Road is plowed to provide access to Paradise, where day visitors can participate in snow play activities (supervised on weekends) and skiing when the snow is deep enough. Winter campers also use the Paradise area as a starting point for trips into the wilderness. The Jackson Visitor Center is open in the winter on

weekends and holidays, but the Paradise Inn, guide house and ranger station are closed.

**Ohanapecosh.** At 1,900 feet, Ohanapecosh is the lowest elevation developed visitor activity area in the park. Public facilities include a campground, a ranger station, and a visitor center. The dominant natural features of the area are the clear waters of the Ohanapecosh River and the associated old-growth forest. Short trails take the visitor to Silver Falls, a powerful 75-foot cascade; the Ohanapecosh Hot Springs (a former health spa); and the Grove of the Patriarchs, located on an island in the middle of the Ohanapecosh River where 1,000 year-old Douglas-fir and western red cedar trees thrive.

The campground and visitor center, usually open from May through October, draw many visitors. Evening campfire programs and naturalist-led walks are among the activities offered in summer. Winter use is limited, with opportunities for snow camping, skiing, and snowshoeing.

**Sunrise.** The Sunrise area contains a visitor center, a gift shop/restaurant, and a picnic area. The typical visitor experience at Sunrise is a social experience in a natural setting. The subalpine environment is characterized by large meadows with scattered groups of subalpine fir and whitebark pine. Park support services, information and interpretive facilities, and a high degree of social interaction enhance the visitor experience.

The Sunrise area offers views of the Mount Rainier summit and an extensive network of hiking trails. The long mountain road to Sunrise ends in the parking lot, which dominates foreground views of the area. Overflow parking in the gravel area surrounding the parking lot increases the influence of vehicles on the character of the experience at Sunrise. The average visitor stays about two and a half hours (BRW, Inc. 1995). The area is usually

closed from mid-October until the Fourth of July weekend.

**White River.** The White River area includes a campground, a picnic area, a ranger station, day-use parking for climbers and hikers, and the historic White River Patrol Cabin (now a Wonderland Trail museum). White River serves as the principal staging area for climbers going up the popular Emmons Climbing Route. Climbers and other wilderness users obtain permits at the White River Ranger Station 4 miles east of the campground. Parking in the area is at a premium on peak summer days when campers, day-users and climbers all compete for limited parking.

**Mowich Lake.** Mowich Lake, the park's largest and deepest lake, is a destination for weekend campers and hikers. Located in the northwest corner of the park, this activity area is isolated from most other activity areas. Because of its remote location, visitation is lower than in the other parts of the park. The lake is within designated wilderness and is surrounded by old-growth forest and scattered subalpine meadows. From Mowich Lake, visitors have access to the Wonderland Trail and Spray Park.

The Mowich Lake area has fewer visitor services than other major activity areas. There is no visitor center or restaurant, and minimal informational and interpretive services are available. Visitors have access to trails that offer a quieter and more natural park experience. The intensity of public use, although higher at the lake's camping and picnicking areas, decreases as visitors explore the surrounding trail network. However, information in the Visitor Distribution Survey (Vande Kamp et al. 1997) from Spray Park documented a peak hourly visitor use as high as 302 visitors.

The road to Mowich Lake is dusty and often wash-boarded. There is no longer an entrance station, and contact with park personnel is

minimal. At the lake the original road-end loop has been converted to a walk-in campground that is exposed and adjacent to the busy trailhead area. Congestion and dust affect the visitor experience at the end of the road, where vehicles turn around. Some visitors park along the roadside, up to 1 mile from the lake. Because many visitors to Mowich Lake take advantage of the trails leading from the area, the average visitor stay is over four hours (BRW, Inc. 1995). The Mowich Lake road is usually closed to vehicular access from November to July (or until the snow melts).

**Carbon River.** Like the Mowich Lake area, the Carbon River area is isolated from other park areas because of its dead-end access road. The Carbon River area is the only location in the park with a remnant inland rainforest. Well-developed old growth forest surrounds the Carbon River activity area, which includes an entrance station, Carbon River Road, the Ipsut Creek campground, and the Ipsut Creek trailhead at the east end of the road.

Visitor use in the Carbon River area includes hiking into the wilderness from the Ipsut Creek trailhead, camping at the Ipsut Creek campground, and viewing the old-growth forest and rainforest habitats along the road. As at Mowich Lake, visitors spend a longer time at the Ipsut Creek area (4.4 hours) than at some of the more heavily visited locations in the park (BRW, Inc. 1995). Carbon River Road is open to year-round use, but snow or flooding can restrict vehicle access from time to time.

### Primary Visitor Activities

According to a 1990 survey of park visitors (Johnson et al. 1991), the most frequently identified visitor activities were driving to view scenery (80%); taking photographs (59%); visiting visitor centers or museums (58%); going for a day hike (51%); observing wildlife (47%); viewing wildflowers (46%); picnicking (30%); and souvenir shopping

(35%). Other activities are camping, climbing, bicycling, fishing, and pack use. In winter, activities such as cross-country skiing, snowshoeing, and snowboarding are popular, along with snow play (sledding, tobogganing, and tubing).

**Sightseeing.** For sightseeing in the park, visitors often drive along the Nisqually to Paradise Road, the Paradise Valley Road, the Stevens Canyon Road, State Routes 123 and 410, or the White River and Sunrise roads to look at the scenery, stop at overlooks, take short walks, read wayside exhibits, admire trees, watch wildlife, spend time at visitor centers, and tour historic buildings. Automobile touring is a traditional way to enjoy the park for visitors who cannot or choose not to engage in nonmotorized activities such as hiking.

**Hiking.** Visitors hike throughout the park in both the nonwilderness and wilderness areas. More than 260 miles of maintained trails, including the 93-mile Wonderland Trail, offer a chance to trek through old-growth forests and view glaciers and subalpine and alpine habitats. The nonwilderness meadows around Paradise, Sunrise, and Tipsoo Lake offer many opportunities for walks and short hikes. Self-guiding trails are available at Twin Firs (the Nisqually to Paradise road), Trail of the Shadows (Longmire), Longmire Historic Walking Tour, Nisqually Vista Loop (Paradise), Grove of the Patriarchs (Ohanapecosh), Ohanapecosh Hot Springs, Carbon River Rainforest Loop, Emmons Vista Overlook (Sunrise), Sunrise (Sourdough Ridge) Nature Trail, and Box Canyon Loop.

The most popular subalpine meadow hikes are at Paradise, Sunrise, Tipsoo Lake, and Spray Park. The popularity of these trails and locations can lead to overcrowding on peak weekends. Overnight use of the wilderness is regulated by a permit system; however, day use of wilderness areas is not regulated.

**Observing Wildlife.** Opportunities for observing wildlife in the park vary with the season and elevation. In summer, chipmunks, chickadees, ground squirrels, marmots, and pika are commonly seen, along with Steller's jay, gray jays, Clark's nutcrackers, and ravens. Deer are commonly seen, and black bears and mountain goats, although more elusive, may also be observed. Elk can also be seen on the east side of the park in September.

**Wildflower Viewing.** Mount Rainier's subalpine meadows offer superb opportunities for viewing and photographing wildflowers. Meadows at Paradise, Sunrise, and Spray Park, as well as roadsides, are some of the park's most popular destinations for this activity.

**Picnicking.** Designated picnic areas are located at Sunshine Point, Cougar Rock, Narada Falls, Paradise, Ohanapecosh, White River, Tipsoo Lake, Box Canyon, Sunrise, Paul Peak, Falls Creek, and Ipsut Creek.

**Camping.** Visitors camp in designated sites in campgrounds in the nonwilderness areas, at designated trailside campgrounds in wilderness areas, and in wilderness areas away from trails. There are more than 550 vehicle campground spaces at five nonwilderness locations within the park: Sunshine Point (open year-round), Ipsut Creek (open most of the year), Cougar Rock, Ohanapecosh, and White River. Campsites are available on a first-come, first-served basis during most of the year, although reserved sites are available in Cougar Rock and Ohanapecosh campgrounds during the peak visitor use season.

Developed sites at Ohanapecosh, Cougar Rock, and White River offer parking spaces, piped drinking water, toilets, refuse cans, tent pads, tables, and benches. Less developed sites at Sunshine Point and Ipsut Creek have parking spaces, drinking water, vault or pit toilets, refuse cans, tent areas, a firepit, and table and bench combinations. Group campgrounds are available by reservation at Cougar

Rock and Ipsut Creek (and planned for White River and Ohanapecosh). These facilities include multiple tent site areas with central firepits and parking. A designated walk-in camping area with an unspecified capacity is located at Mowich Lake. During the peak visitor season, many campgrounds fill to capacity, especially on weekends and holidays. Campfires and campfire (evening) programs are a popular element of the camping and visitor experience.

Wilderness camping is available at more than 30 designated trailside camps along the park's extensive network of trails. Camp Muir and Camp Schurman serve climbers to the summit of Mount Rainier. The capacity of these campsites ranges from 6 people to 110 at Camp Muir. Camping is also permitted throughout the wilderness in the cross-country and alpine zones.

**Climbing.** Every year more than 10,000 people attempt to climb Mount Rainier's summit. All people attempting to climb beyond designated areas must have a climbing permit, which requires orientation to hazardous conditions and resource protection measures. A concessioner guide service offers training seminars, special hikes and programs, and a three-day climbing school and summit climb. Three primary and numerous secondary routes are available. Most summit climbs begin at Paradise up the Muir corridor. The Emmons Glacier route beginning at the White River trailhead is the next most popular starting point. A climb to Mount Rainier's summit typically involves an overnight stay on the mountain. Many other areas in the park are popular with visitors for day hikes and climbs.

**Bicycling.** Although bicycles are allowed on park roads, there are no specifically designated bicycle trails in the park. Park roads are often steep, narrow, and winding, with unpaved shoulders that make cycling a challenge. No bicycling is allowed on pedestrian walkways or hiking trails.

Limited bicycling takes place on Carbon River Road and Westside Road, and it has increased slightly because of closures on these roads. The route from the Nisqually Entrance to Paradise is a challenging 19-mile one-way ride with an elevation gain of 3,400 feet. Carbon River Road offers an opportunity to ride through a temperate rainforest. Cyclists occasionally may ride from the Longmire Community Building through the Old Longmire campground and out to Forest Service Road 52 (Skate Creek Road), which offers an opportunity for a return loop to Ashford and then back to Longmire.

**Fishing.** Recreational fishing was formerly tracked in the park, but now it appears to be minimal and is not monitored. Some social science research (Keman and Drogin 1994; Samora 1993) documented visitors' primary and secondary trip objectives. Where fishing was listed as a visitor activity, it was only incidental to other activities such as hiking or viewing wildlife and wildflowers. Information about anglers derived from the wilderness (overnight use) permit system suggests that fishing is not a major wilderness activity for most visitors (Samora 1993).

**Pack Stock Use.** Pack stock such as horses, mules, burros, and llamas are used primarily by wilderness visitors. Although the park currently has more than 100 miles of stock use trails, there is minimal pack stock activity, with fewer than six groups per year taking part in this activity, with fewer than 10 people per group. However, along the Pacific Crest Trail, which follows the eastern border of the park, pack stock use is more frequent.

A few campsites along the park trails are designated for stock use (Deer Creek, North Puyallup River, Three Lakes, and North Mowich River). Stock use is permitted in designated areas but prohibited in cross-country areas. The following trails or roads are open to stock use: Wonderland Trail from Ipsut Creek to North Puyallup River; North

Puyallup River Trail; Westside Road; Paul Peak Trail to North Mowich Stock Camp; Wonderland Trail from Longmire to Box Canyon; Rampart Ridge Loop Trail (including Wonderland Trail portion); Pacific Crest Trail; Naches Peak Trail to Pacific Crest Trail; East-side Trail to Silver Falls Loop; and the Laughingwater Creek Trail to Pacific Crest Trail. Park regulations related to stock use require stock to be tied or stabled only at provided hitching rails or corrals. Stock party sizes are limited to a maximum of 12 on the Pacific Crest Trail, and stock are prohibited in auto campgrounds, picnic areas, and wilderness campsites unless at a designated stock camp.

**Winter Activities.** Popular winter activities in Mount Rainier are snow play (sledding, tobogganing, tubing), snowshoeing, cross-country skiing, and snowboarding. Winter use is concentrated at Longmire, Paradise, and Ohanapeosh. A groomed snow play area is available at Paradise, and snow play is prohibited elsewhere in the park. Snowshoeing, snowboarding, and cross-country skiing are allowed throughout the park.

#### **WILDERNESS VALUES AND EXPERIENCES**

Wilderness has many natural, ecological, geological, cultural, scenic, scientific, and recreational values. In 1988 Congress designated some 97% of Mount Rainier National Park (228,480 acres) as wilderness. Some of its natural and scenic values include the mountain itself (an “arctic island in a temperate zone”), the glaciers that mantle the mountain and the lakes and rivers they feed, brilliant displays of wildflowers in subalpine meadows, and dense ancient rainforest. Other outstanding scenic values are found throughout the wilderness in areas like Comet Falls, the Tatoosh Range, Burroughs Mountain, Spray Park, and Summerland. Cultural values in the wilderness include the historic Wonderland and Northern Loop trails, patrol cabins, trail shelters, fire

lookouts, and archeological and ethnographic resources.

Mount Rainier’s wilderness also has many valuable natural features for scientific study, including vegetation and wildlife, ecology, geology, volcanism, glaciers, snow and streamflows, archeological resources, and ethnographic resources. These resources afford excellent opportunities to study ecosystem structure, functions, processes, and components. The National Park Service, the U.S. Geological Service, the University of Washington, and other academic and governmental organizations have conducted research in the wilderness area. For example, Nisqually Glacier has been studied longer than any other glacier in the Western Hemisphere (Driedger and Samora 1999).

The Mount Rainier Wilderness offers a range of primitive recreational experiences. The primary summer activities that visitors pursue are hiking, backpacking, and climbing. Related activities are viewing wildlife and wildflowers, photography, and picnicking. Several wilderness trails are open to stock use, including the Pacific Crest Trail, the Rampart Ridge loop, and the North Puyallup River trail. Popular winter activities include cross-country skiing, snowshoeing, and snow camping.

Day hiking is the most common activity in wilderness. The 1995 survey of wilderness trail users found only 8% of the respondents reported backpacking and camping overnight, and 2% reported the use of mountain climbing equipment (Vande Kamp, Swanson, and Johnson 1999).

Wilderness values, primarily solitude and opportunities for primitive, unconfined recreation, are an important part of the visitor experience. There are many outstanding opportunities for solitude.

Most wilderness use occurs from June through September. During other months (including the

winter) and summer weekdays (except during August) few people, if any, are encountered in the vast majority of the wilderness area.

The 23% of wilderness users who are cross-country hikers usually do not see other people, even in summer. On summer weekends and holidays, however, high numbers of people may be encountered in areas close to roads and activity centers, on popular trails like the Wonderland Trail, at wilderness trailside camps, and along the Muir and Emmons climbing routes. This results in fewer opportunities for solitude during that time. Where day use has been documented, the most heavily used day trails have been Spray Park, Carbon Glacier, Summerland, Comet Falls/ Van Trump Park, and Snow Lake (Samora 1993), as well as the Naches Loop Trail.

In a study conducted by the National Park Service (1992c), the following were the most heavily used wilderness trails, as documented by total trail encounters or average daily encounters with day hikers, backpackers, and climbers combined:

<b>Wilderness Trail</b>	<b>Number of Users</b>
Naches Loop Trail	95
Comet Falls	49
Ipsut Creek to Carbon Glacier	49
Snow/Bench Lake	40
Pinnacle Peak	42
Fryingpan Creek to Summerland	35
Narada Falls	34
Summerland to Indian Bar	33
Glacier Basin	21
Spray Park	28
Carbon Glacier to Mystic Lake	27

However, on a weekend day, as many as 300 day hikers have been documented along one popular subalpine trail (Spray Park Trail). In winter the majority of wilderness users visit Mazama Ridge, Reflection Lakes, Ice Caves (although the Ice Caves no longer exist due to the receding Paradise Glacier), and Van Trump Park.

The relatively high use level of some trails is affecting the quality of some visitors' wilderness experience. For example, a 1993 visitor survey in the Spray Park area found that 15% of the weekday visitors and 44% of the weekend visitors reported they felt crowded by the number of people at some time during their visit (Vande Kamp, Johnson, and Swanson 1998). In a 1995 survey of wilderness trail users, 37% of respondents reported seeing more visitors than they preferred on weekdays, while 44% saw more visitors than they preferred on weekends. About 41% of Mount Fremont respondents, 34% of Glacier Basin respondents, 26% of Summerland respondents, and 24% of Comet Fall respondents said they felt moderately to extremely crowded (Vande Kamp, Johnson, and Swanson 1999). A 1995 survey of overnight backpackers found that 34% of the respondents felt crowded by the number of people they encountered in the trail zones (Van de Kamp and Johnson in prep.).

Limits of acceptable change (LAC) rules and regulations are in place for overnight uses in the Mount Rainier Wilderness. These rules and regulations help minimize resource impacts and ensure opportunities for high quality experiences, but they restrict the freedom of people to go when and where they wish, which some may view as confining their experience. Some of these regulations are as follows:

- Permits are required for overnight camping, groups, and climbing.
- Camping along trails is permitted only at established trailside camps.
- In cross-country areas, camping must be at least 0.25 mile from any established trail and at least 100 feet from lakes, streams, and other wetlands.
- Use limits are required in cross-country areas between June 1 and September 30, and whenever there is less than 2 feet of snow. For example, cross-country parties

cannot exceed five people, unless the party is a single immediate family.

- In alpine areas, party size may not exceed 12 people when camping on snow and ice and five people when camping on bare ground.
- Camping is not allowed in the “fell fields” on either side of the Muir Snowfield, which leads to Camp Muir.

Other rules and restrictions apply to group camping, the use of pack stock, the use of certain items and activities (e.g., building fires, disposing of human waste, and bringing pets). No regulations govern day use in the wilderness area, although the park’s Wilderness Committee has recommended a maximum day-use group size of 12 people (with the exception of authorized educational groups).

The vast majority of wilderness appears natural. Structures located in the wilderness are four public shelters; nine patrol cabins; four fire lookouts; four radio repeaters; and 39 wilderness trailside camps. One maintained powerline right-of-way extends from Longmire to Paradise, and a telephone line to Sunrise also is maintained. Other structures include 260 miles of maintained trails and associated structures (including bridges, foot logs, culverts, and rock walls), wilderness toilets, and trail signs (NPS 1992c). These structures are located infrequently throughout the wilderness.

Other signs of human activity and structures are evident where the wilderness boundary is close to the existing road system and to high

use areas (such as near the White River campground and at Mowich Lake). Developments in the Crystal Mountain Ski Area, outside the eastern boundary of the park, and clearcuts outside the park’s north and western boundary can be seen from many vantage points in the wilderness.

There are signs of disturbance or alteration of resources due to visitor impacts, particularly in higher use areas. Signs of human waste may be found along the more popular climbing routes, and ground vegetation may have been removed by camping or trampling. Other signs of human use include informal campsites, campfire scars, mutilated trees, litter, and rock walls built for windbreaks.

This diminishment of the naturalness of these areas may be affecting visitors’ enjoyment of the wilderness experience. For example, a 1993 visitor survey found that about half of the respondents (49%) reported the Spray Park area was suffering unacceptable damage, 91% heard human voices, 86% saw unmarked trails, and 85% saw trampled vegetation (Vande Kamp, Johnson, and Swanson 1998). In a 1995 survey of wilderness trail users, 28% of the respondents reported observing unacceptable damage at Mount Fremont, while 22% reported this at Glacier Basin (Van de Kamp, Johnson, and Swanson 1999). Damage associated with off-trail hiking and social trails was the most commonly reported impact (58% of respondents reported seeing unacceptably damaged resources, but this group comprised only 11% of all respondents), followed by those concerned with garbage or litter.

## SOCIOECONOMIC ENVIRONMENT

### REGIONAL CONTEXT

The area affected by park operations and visitor activities includes parts of four counties (King, Pierce, Lewis, and Yakima). There has been a moderate but steady increase in the regional population of the four-county area during the past decade or more. Growth in the Puget Sound area, which has a large population base, has begun to infringe on the private lands near the park's western boundary. Current proposals for development projects (both residential and commercial) on private land may bring new transportation services to the boundaries of Mount Rainier and attract additional commercial uses to the gateway communities.

### Population

The population in the counties most affected by Mount Rainier National Park over the past two decades is shown in table 14.

Growth in King County was slightly higher than the statewide average during the 1980s, but between 1990 and 1999 county growth slowed somewhat. Pierce County experienced rapid population growth throughout the entire 20-year period, and population growth in Lewis and Yakima Counties was modest during the 1980s but substantial between 1990 and 1999.

Over the next 20 years, population in King, Pierce, Lewis, and Yakima Counties is expected to show continued steady growth (table 15).

### Tourism Trends

Travel expenditures in King County increased from \$3.4 billion in 1991 to \$4.1 billion in 1995. This increase in nominal dollars (that is, not adjusted for inflation) resulted in a total increase of 19.6%. Expenditures in King

**TABLE 14: POPULATION FOR MOUNT RAINIER COUNTIES, 1980–1999 (to nearest thousand)**

Affected Region	1980	1990	1999
King County	1,270,000	1,510,000	1,667,000
Pierce County	485,700	586,200	700,000
Lewis County	56,000	59,400	69,000
Yakima County	172,500	188,800	212,300

SOURCES: Census Bureau and State of Washington 1999; State of Washington 1995.

**TABLE 15: POPULATION PROJECTIONS FOR MOUNT RAINIER COUNTIES, 1999–2020**

Affected Region	1999	2005	2115	2020
King County	1,667,000	1,763,600	1,929,900	2,030,700
Pierce County	700,000	763,800	863,500	916,099
Lewis County	69,000	76,000	86,300	92,400
Yakima County	212,300	227,600	255,300	271,700

SOURCES: Census Bureau and State of Washington 1999; State of Washington 1995.

County represented about one-half of total state travel expenditures. The data suggest that visitor travel has increased at a modest annual rate of 1.8% from 1991 to 1995. It is likely that future growth would follow this trend.

Pierce County travel expenditures amounted to \$459.7 million in 1995, increasing from \$372.4 million in 1991, for an overall increase of 23.4%. The travel expenditure data suggest that visitor travel has grown at a slightly greater rate (2.6% per year) than the statewide average. Visitor growth during the foreseeable future is likely to follow the recent trend.

Of the four counties, Lewis County experienced the highest rate of growth in travel expenditures, with expenditures rising from \$61.7 million in 1991 to \$101.5 million in 1995, for an overall increase of 64.6%. At 10.5% per year, the growth rate is far above the statewide average (2.8% per year). Although future travel growth is likely to remain high, it is unlikely that the recent trend can be sustained, as generally very high consumption demand typically falls off due to infrastructure capacity limitations as well as changes in consumption preferences.

Yakima County showed the lowest gains in travel expenditures during the four-year period, with total spending by visitors increasing from \$191.3 million in 1991 to \$221.7 million in 1995 for an overall increase of 15.9%. The expenditure data indicate only modest increases in visitor travel (1.0% per annum) to Yakima County. The trend suggests modest visitor travel growth during the foreseeable future.

### **Landownership and Land Uses adjacent to the Park**

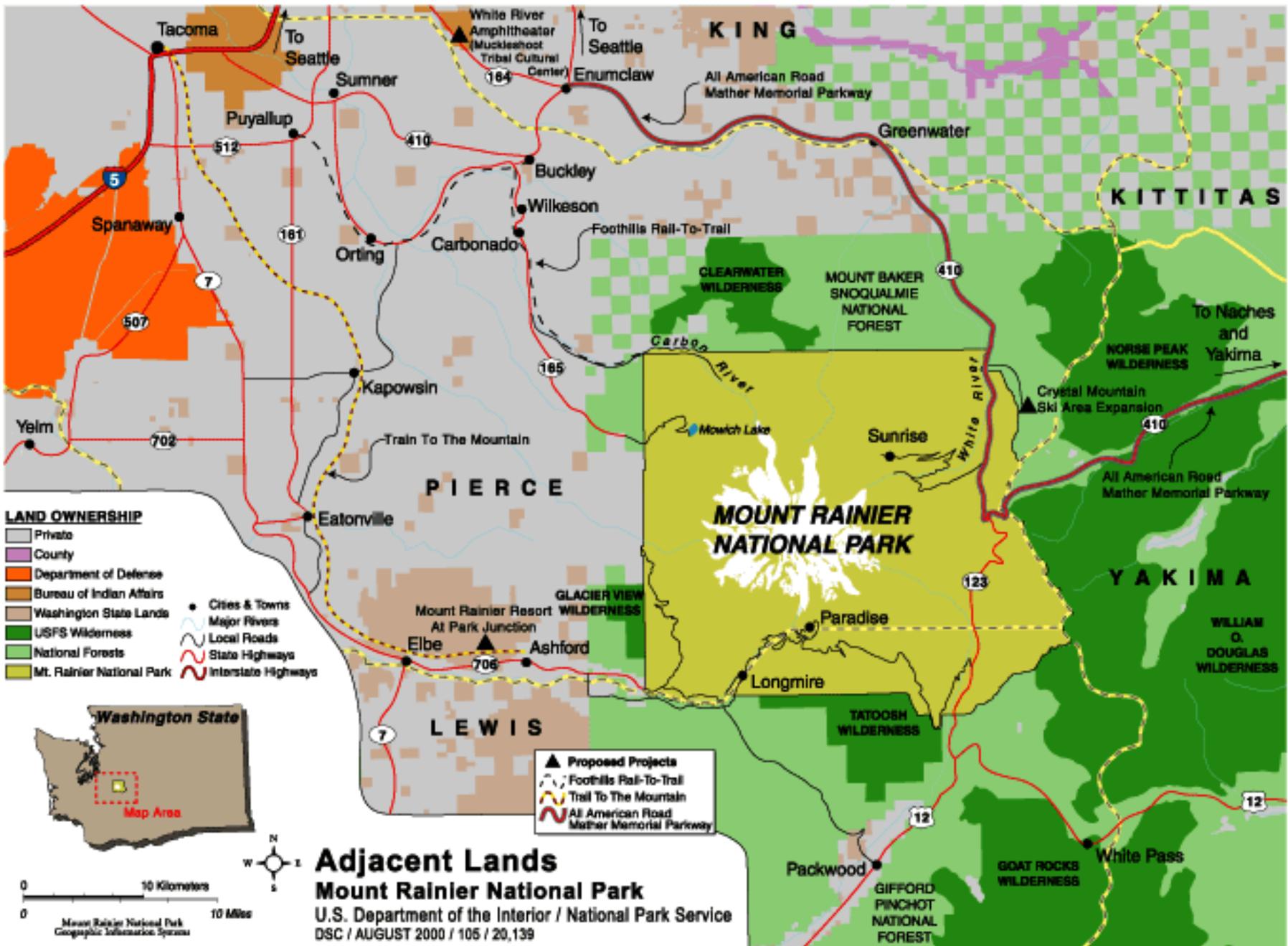
**National Forests.** Mount Baker-Snoqualmie National Forest is adjacent to the park's northern boundary and part of its southwest, northwest, and northeast boundaries (see

Adjacent Lands map). The Clearwater Wilderness (14,598 acres) is within this national forest and borders the park on the north. The Glacier View Wilderness (3,080 acres), on the park's west boundary, is also within the Mount Baker-Snoqualmie National Forest, but Gifford Pinchot National Forest administers this wilderness. Wenatchee National Forest, east of the park, contains the William O. Douglas Wilderness (166,603 acres), which shares a large part of the park's eastern boundary. Gifford Pinchot National Forest shares a border with the park on the south. The Tatoosh Wilderness (15,700 acres) is within this national forest and borders the park on the south.

**State and Private Lands.** No state lands border Mount Rainier National Park. However, major parcels of land owned by the Washington Department of Natural Resources are south and west of the park's Nisqually entrance. These lands are managed for timber harvesting to provide funds for schools and other state expenditures.

Rainier Timber Company, LLC, owns approximately 120,000 acres near the park and shares approximately 6 miles of the park's western boundary. Plum Creek Timber Company shares 2.5 miles of the park boundary, with approximately 1,920 acres in four sections adjacent to and near the Carbon River area and one on the western boundary. Timber sales for two of these sections, within the Carbon River valley, are planned between 1999 and 2005. Some logging roads end at the park boundary, but many are closed or offer little access. Timber sales are also planned in near the Nisqually entrance in the near future.

Rainier Timber Company's lands are open for public recreation for a fee. Access is by foot, bicycle, or automobile. Camping, hiking, hunting, and mountain biking are some of the activities available. All-terrain vehicles, horses, motorcycles, and snowmobiles are not allowed.



Tacoma

To Seattle

Sumner

White River Amphitheater (Muckleshoot Tribal Cultural Center)

To Seattle

KING

All American Road Mather Memorial Parkway

Greenwater

Puyallup

410

Buckley

KITTITAS

Spanaway

181

Orting

Wilkeson

Foothills Rail-To-Trail

CLEARWATER WILDERNESS

MOUNT BAKER SNOQUALMIE NATIONAL FOREST

507

Carbonado

Carbon River

To Naches and Yakima

NORSE PEAK WILDERNESS

Yelm

7

Kapowsin

Train To The Mountain

185

Mowich Lake

Sunrise

Crystal Mountain Ski Area Expansion

All American Road Mather Memorial Parkway

Eatonville

PIERCE

**MOUNT RAINIER NATIONAL PARK**

YAKIMA

GLACIER VIEW WILDERNESS

Mount Rainier Resort At Park Junction

Ashford

WILLIAM O. DOUGLAS WILDERNESS

Elbe

706

Longmire

Paradise

123

LEWIS

TATOOSH WILDERNESS

**Proposed Projects**  
 Foothills Rail-To-Trail  
 Trail To The Mountain  
 All American Road Mather Memorial Parkway

Packwood

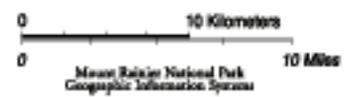
12

GIFFORD PINCHOT NATIONAL FOREST

GOAT ROCKS WILDERNESS

White Pass

12



AFFECTED ENVIRONMENT

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The park is within Pierce and Lewis Counties. Yakima County borders the park on the east. These counties hold jurisdiction over land use on private lands. Each has, or is working on, a current land use plan to manage land use and development within their jurisdictions.

## **GATEWAY COMMUNITIES**

Local gateway communities are Elbe and Ashford to the southwest, Packwood to the south, Wilkeson and nearby Carbonado to the northwest, Greenwater to the north, and Naches to the east. These local gateway communities are quite small. In most cases they provide food, lodging, recreation supplies, and services to park travelers. In some cases the local communities have other economic functions and pursuits.

Enumclaw and Eatonville also are considered gateway communities to Mount Rainier National Park. Both are currently involved in vision planning. Eatonville recognizes that a significant portion of tourism economic potential is not being captured, and the town is considering alternatives to capture a larger portion of regional tourism travel.

Both Eatonville and Enumclaw are exploring greater tourism partnerships. Enumclaw is specifically interested in and coordinating with the park and others in the study of a multi-agency visitor/welcome center to the relatively new Mather Memorial Parkway (State Route 410) All American Road corridor. Eatonville is exploring traffic calming, downtown historic preservation, pedestrian and streetscape improvements, and potential collaboration with the Train to the Mountain, as well as its mill-town heritage and other assets that would promote increased visitor stays and the additional capture of tourism economic benefits.

Although not gateway communities, the Seattle-Olympia-Tacoma region is the most heavily populated area of the state of

Washington. The population for the Seattle-Tacoma-Bremerton combined metropolitan statistical area in 1999 was about 3.2 million (State of Washington 2000). The 40–90 or more minute drive from these areas enables people to make a day trip to the park with little prior planning. (Park visitation statistics show a correlation between being able to see the mountain from these areas and increased visitation.)

### **Elbe and Ashford**

Elbe and Ashford are located on the most popular route to Mount Rainier National Park. Elbe, which is unincorporated, lies between the steep Cascade foothills to the north and east and Alder Lake and the Nisqually River to the south and west. It has limited commerce and lodging facilities. The Mount Rainier Scenic Railroad, based at Elbe, currently runs about 6 miles south to Mineral (Lewis County) and has the potential to run to Eatonville, Morton, and “National” and possibly Ashford.

Between Elbe and Ashford is the park’s Tahoma Woods administrative headquarters, comprising a small employee housing area, the park greenhouse operations, and storage areas, in addition to the administrative building. Adjacent to Tahoma Woods is Columbia Crest School, now teaching kindergarten through 6th grades for the communities of Ashford, Elbe, and Alder. (A middle school and high school are in Eatonville.) Also located between these small towns is the remnant community of “National,” a historic logging town, now recognized by the presence of the Ashford Lion’s Hall at the end of the train tracks. This area also contains homes, churches, and minor commercial development. The next nearest rural town is Ashford. Ashford is at the intersection of Mount Tahoma Canyon Road and State Route 706. It is approximately 6 miles west of the park’s Nisqually entrance. The unincorporated Ashford community has a broad array of tourist facilities. Ashford is the

last town before park visitors reach the Nisqually entrance to the park, although farther east along State Route 706, closer to the Nisqually entrance, there are additional lodging facilities and considerable tourist commercial development.

### **Packwood**

The town of Packwood is located on U.S. Highway 12 in Lewis County, approximately 14 miles south of the Stevens Canyon park entrance and 12 miles from Ohanapecosh. Because of its nearness to White Pass ski area, Packwood generates considerable economic activity from skiers and other winter recreation visitors. Similarly, its being near to Mount Rainier National Park and the Tatoosh Wilderness in Gifford Pinchot National Forest is advantageous for tourism-oriented businesses providing goods and services for summer visitors and for hunters in autumn. The town hosts a joint U.S. Forest Service and Chamber of Commerce visitor contact facility, which offers local services and park information.

Packwood derives substantial economic benefits from both summer and winter tourism activity, with local businesses that offer goods and services to tourists being the primary beneficiaries. In addition, major recreation and retirement-oriented residential developments have been established in the Packwood area.

### **Wilkeson and Carbonado**

Wilkeson and Carbonado are a few miles apart on State Route 165, which leads to the Mowich and Carbon River entrances to the park. Wilkeson has modest tourism-oriented facilities and services. The National Park Service operates a visitor contact/ranger station in Wilkeson, where visitors can receive information about the park and obtain wilderness permits. Carbonado has limited tourist-oriented establishments.

### **Greenwater**

Greenwater is an unincorporated community in King and Pierce Counties on State Route 410 between Enumclaw and Mount Rainier National Park. With its basic recreation-oriented services, Greenwater is a favorite stopover point for skiers traveling to and from the Crystal Mountain ski resort in winter, as well as for campers and tourists driving the north side of Mount Rainier National Park on State Route 410.

### **Enumclaw**

Enumclaw, in south central King County, is a rural city that serves both as a crossroads community and a local trade and community center. There is considerable tourism infrastructure and locally oriented commercial development. Enumclaw receives many travelers, primarily from metropolitan areas in King County. The city is a popular stopover for travelers en route to Mount Rainier National Park, primarily in spring, summer, and fall, as well as people going to the Crystal Mountain Ski Area and other winter recreation areas served by State Route 410. Enumclaw has a broad array of tourist facilities, as well as general merchandise and recreation equipment businesses.

As with other communities that have traditionally depended on resource-based economies (namely, forest harvesting and processing), Enumclaw is increasingly becoming a bedroom community for workers employed in urbanized areas in Pierce and King Counties. In addition, tourism is developing as a major component of the local economy. Visitor travel to the park, particularly from King County locations, contributes to the economic vitality of the community. There is a relatively new visitor contact/ranger station shared by the Chamber of Commerce, the U.S. Forest Service (Mount Baker-Snoqualmie National Forest (Snoqualmie

District) and Mount Rainier National Park. Discussions are ongoing regarding the potential development of a joint city of Enumclaw, chamber of commerce, national forest, and national park “welcome center.”

### **Eatonville**

Eatonville is on State Route 161, approximately 26 miles west of the park’s Nisqually entrance. Eatonville is quite close to the Tacoma-Olympia corridor: a 30-mile commute radius from Eatonville would encompass a substantial area containing urban jobs within the corridor. The character of Eatonville is a combination of forest resource activities and a bedroom community for urban commuters. It is a popular stop for tourists and appears to be establishing itself as a gateway to Mount Rainier National Park. In addition, Eatonville is becoming a visitor destination offering a variety of opportunities to tourists and recreational visitors.

### **REGIONAL RECREATIONAL OPPORTUNITIES**

There are a variety of parks and recreational areas in the vicinity of Mount Rainier National Park. Some of the well-known facilities are listed below.

- Northwest Trek, owned and operated by Metro Parks Tacoma, is a 435-acre native northwest wildlife park located near Eatonville.
- Alder Lake Park, owned and operated by Tacoma City and Light, is a 148-acre day-use and overnight-use park located off State Route 7 near Alder Dam; it also includes Sunny Beach Point and Rocky Point.
- Sunny Beach Point, also owned and operated by Tacoma City and Light, is a 9-acre day-use park located off of State Route 7 at the Eatonville cutoff road.
- Rocky Point, also owned and operated by Tacoma City and Light, is a small day-use and overnight-use park on the north shore of Alder Lake off of State Route 7.
- Elbe Hills State Forest, just north of State Route 706, is owned and managed as a timber and recreation resource area by the Washington Department of Natural Resources.
- Tahoma State Forest, south of Ashford and accessible from State Route 706, is also owned and managed by the Washington Department of Natural Resources.
- Mount Tahoma Trails, 100 miles of cross-country skiing on snow-covered logging roads, is a partly connected system of hiking/bicycling/ski trails in Elbe Hills Forest, Tahoma State Forest, and on privately owned timberland.
- The Snoqualmie Ranger District of Mount Baker-Snoqualmie National Forest encompasses numerous recreation facilities. Crystal Mountain, about 25 miles east of Greenwater, is a year-round destination resort with hiking, mountain biking, and other alpine activities in summer and alpine skiing in winter. Other recreation facilities in the Snoqualmie Ranger District include the Silver Spring campground, where a visitor information center began operations in the summer of 1997.
- On the southeast side of the park, the Packwood work center/visitor information facility operates and manages numerous national forest campgrounds in the Cowlitz District of Gifford Pinchot National Forest. This facility offers visitor information regarding the greater region, including Forest Service areas, the park, White Pass ski area, and Packwood. Recreational sites

in this area are four fee campgrounds, two free campgrounds, and picnic areas.

### **CONCESSIONS AND BUSINESS PERMITS**

The National Park Service uses concession contracts and commercial use licenses (formerly incidental business permits) to manage commercial activities. As of October 1998, Mount Rainier National Park had two ongoing concession contracts, one limited concession permit to provide firewood at Ohanapecosh and White River campgrounds, and 21 incidental business permits. The concession contracts are discussed below.

#### **Rainier Mountaineering, Inc. (contract expires October 31, 2001)**

Rainier Mountaineering provides the following services:

- snow and ice climbing schools
- guided summit climbs, primarily using the Muir corridor (excluding Emmons Glacier via the Camp Schurman route)
- sales of climbing gear and merchandise

- rental of climbing gear
- guest/employee shuttle service

Other services authorized, but not required, are guided hiking through the park (without stock) in summer and various seminars. Government-assigned buildings are the Paradise Guide House and the Camp Muir cook shelter. The concessioner owns the Gombu sleeping and storage shelter.

#### **Guest Services, Inc. (contract expires December 31, 2012)**

Guest Services offers the following services:

- food and beverage sales
- hotel and lodging
- merchandise (except climbing gear)
- camper supplies
- cross-country ski tours and related activities and services

Government-assigned facilities are those at Paradise, Longmire, and Sunrise. The concessioner owns a modular dormitory at Longmire and the Glacier dormitory at Paradise.



# Environmental Consequences



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## INTRODUCTION

The National Environmental Policy Act (NEPA) mandates that environmental impact statements disclose the environmental effects of proposed federal actions. In this case, the proposed federal action would be the adoption of a general management plan for Mount Rainier National Park. This “Environmental Consequences” chapter analyzes the potential effects of three management alternatives on natural resources, geologic hazards, cultural resources, the visitor experience, and the socioeconomic environment of Mount Rainier National Park. By examining the environmental consequences of all alternatives on an equivalent basis, decision-makers can decide which approach creates the most desirable combination of the greatest beneficial results with the fewest adverse effects on the park.

The alternatives in this general management plan provide broad management directions. Because of the general nature of the alternatives, the potential consequences of the alternatives are analyzed in similarly general terms using qualitative analyses. Thus, this environmental impact statement should be considered a programmatic analysis. Consistent with the National Environmental Policy Act, the National Park Service would conduct additional environmental analyses with appropriate documentation before implementing site-specific actions.

The existing conditions for all of the impact topics that are analyzed here were identified in the “Affected Environment” chapter. All of the impact topics are assessed for each alternative. For each impact topic, there is a description of the positive (beneficial) and negative (adverse)

effects of the alternative, a discussion of the cumulative effects when this project is considered in conjunction with other actions occurring in the region, and a brief conclusion.

The no-action alternative (continue current management) analysis identifies what future conditions would be if no changes to facilities or park management occurred. This alternative reflects changes associated with the growth in regional population and increased visitor use that is anticipated during the next 20 years. The two action alternatives were then compared to the no-action alternative to identify the incremental changes that would occur as a result of changes in park facilities and management.

Impacts of recent decisions and approved plans, such as developing an environmental education center at Tahoma Woods, are not evaluated as part of this environmental analysis. Although these actions would occur during the life of the general management plan, they have been (or will be) evaluated in other environmental documents.

At the end of each alternative there is a brief discussion of energy requirements and conservation potential; unavoidable adverse impacts; irreversible and irretrievable commitments of resources; and the relationship of short-term uses of the environment and the maintenance and enhancement of long-term productivity. The impacts of each alternative are briefly summarized in table 8, at the end of the “Alternatives, including the Preferred Alternative” chapter.

## METHODOLOGIES

The environmental consequences to each impact topic were defined based on impact type, intensity, and duration, and whether the impact would be direct or indirect. Cumulative effects also were identified. Clarification of each of these concepts for Mount Rainier National Park is provided below.

### DEFINITIONS

#### Impact Type

The effects that an alternative would have on an impact topic could be either adverse or beneficial. In some cases, the action could result in *both* adverse and beneficial effects for the same impact topic. For example, under the visitor access impact topic, both of the action alternatives would have a beneficial effect by reducing congestion and providing access via shuttles and an adverse effect by inconveniencing some visitors through restrictions on overflow parking.

#### Intensity

This evaluation used the approach for defining the intensity (or magnitude) of an impact presented in *Director's Order 12: Conservation Planning, Environmental Impact Analysis and Decision-making* (NPS 2001c). Each impact was identified as negligible, minor, moderate, or major in conformance with the criteria for these classifications provided below by impact topic. Because this is a programmatic document, most intensities were expressed qualitatively.

#### Duration

The planning horizon for this *General Management Plan* is approximately 20 years. Within this timeframe, impacts that would occur within five years or less were classified

as short-term effects. Long-term effects would last for more than five years. For example, increased air emissions from alternative 2's construction of a replacement visitor center at Paradise would produce a short-term adverse impact on air quality. Reduced air emissions from the replacement of many automobiles with a shuttle service would result in a long-term beneficial effect on air quality.

#### Direct Versus Indirect Impacts

Direct effects would be caused by an action and would occur at the same time and place as the action. Indirect effects would be caused by the action and would be reasonably foreseeable but would occur later in time, at another place, or to another resource. For example, efforts to keep visitors on trails in both action alternatives would reduce damage to plants, a direct beneficial effect on vegetation. More vegetation would help reduce soil erosion and sedimentation of waterways, so that efforts to keep visitors on trails would have indirect beneficial effects on both soils and water quality.

#### Cumulative Impacts

Impacts on the environment can result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other action. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. For example, increased development of private lands throughout the region reduces the availability of habitat for threatened and endangered species, regardless of in-park actions. In evaluating the proposed relocation of administrative facilities from the Carbon River entrance to lands that would be included in the

boundary adjustment, the National Park Service considered this project's potential to disturb threatened and endangered species habitat as additive with the habitat loss resulting from other development in the region.

The impact analysis and conclusions were based on information available in the literature, data from park studies and records, and information provided by experts within the National Park Service and other agencies. Unless otherwise stated, all impacts were assumed to be direct and long term and would occur in the summer.

All the impact analyses assumed that mitigating measures would be applied at the time the alternative was implemented in order to minimize or avoid impacts. Mitigating measures were described in the "Alternatives, including the Preferred Alternative" chapter of this document.

## NATURAL RESOURCES

Analysis of natural resources was based on research, knowledge of park resources, and the best professional judgment of planners, biologists, hydrologists, and botanists who have experience with similar types of projects. Information on the park's natural resources was gathered from several sources, including the U.S. Fish and Wildlife Service (1984) *National Wetlands Inventory* maps, a 1988 study of Mount Rainier's forest communities (Franklin et al. 1988), satellite imagery of vegetation, and site-specific resource inventories for wetlands, wildlife, water quality, fisheries, and amphibians. As appropriate, additional sources of data are identified under each topic heading.

### Air Quality

The relationship of existing pollution sources to the ambient air quality in Mount Rainier National Park has not been sufficiently studied

and modeled to quantitatively assess impacts. Consequently, air quality impacts were assessed qualitatively.

- *Negligible* — An action would have no measurable or detectable effect.
- *Minor* — An action would have a slight effect, causing a change in air emissions or visibility.
- *Moderate* — An impact would be clearly detectable and would cause an appreciable change in air emissions or visibility.
- *Major* — An action would cause a substantial, highly noticeable change in air emissions or visibility.

### Water Resources and Water Quality

The relationship of pollution sources to existing water quality in Mount Rainier National Park has not been sufficiently studied and modeled to quantitatively assess impacts. The absence of baseline information on the physical, chemical, and biological characteristics of park surface waters and groundwaters makes it difficult to detect changes in water quality. Consequently, water quality impacts of the alternatives were assessed qualitatively.

- *Negligible* — An action would have no measurable or detectable effect on water quality or the timing or intensity of flows.
- *Minor* — An action would have measurable effects on water quality or the timing or intensity of flows. Water quality effects could include increased or decreased loads of sediment, debris, chemical or toxic substances, or pathogenic organisms.
- *Moderate* — An action would have clearly detectable effects on water quality or the timing or intensity of flows and potentially would affect organisms or natural ecologi-

cal processes. Alternatively, an impact would be visible to visitors.

- *Major* — An action would have substantial effects on water quality or the timing or intensity of flows and potentially would affect organisms or natural ecological processes. Alternatively, an impact would be easily visible to visitors.

### Floodplains

The impact assessment for floodplains is focused on natural river processes and aquatic habitat. Public safety conditions related to flooding are addressed in the analysis of geologic hazards.

Three types of flooding occur in the park: precipitation-induced flooding, glacial meltwater flooding, and glacial outburst flooding. Extreme floods are known to trigger debris flows (or lahars) that are composed of water, ice, sediment, and other debris in rivers and streams that flank the volcano. Impacts of debris flows are addressed in the analysis of geologic hazards.

Data derived from geographic information system (GIS) mapping, hydraulic models of the Carbon and Nisqually Rivers near major park developments, and detailed floodplain maps of major development areas were used in the analysis. In addition, detailed floodplain studies were undertaken that included site surveys and hydraulic models constructed to assess flood hazards and conditions and to map floodplain boundaries in certain locations.

The *Floodplain Management Guideline* (NPS 1993b) and the extent of alteration to natural river processes were used to define the intensity of impacts.

- *Negligible* — Impacts would occur outside the regulatory floodplain as defined by the *Floodplain Management Guideline* (100-

year or 500-year floodplain, depending on the type of action), or no measurable or perceptible change in natural river processes or aquatic habitat would occur.

- *Minor* — Actions within the regulatory floodplain would potentially interfere with or improve river processes or aquatic habitat in a limited way or in a localized area. Levee maintenance and streambank manipulations that would protect development areas from flooding are examples of actions that would result in minor adverse impacts. Removing flood protection devices or small facilities would result in beneficial impacts.
- *Moderate* — Actions within the regulatory floodplain would interfere with or enhance river processes or aquatic habitat in a substantial way or in a large area. Examples of adverse moderate impacts would include substantial modification of streambanks to protect roads in multiple locations or to protect large compounds such as Longmire.
- *Major* — An action would permanently alter or improve a floodplain or significantly alter or improve natural river processes or aquatic habitat. An example might include permanent hardening and/or relocation of a braided river channel that prevents the river from meandering over time.

### Wetlands

Wetland impacts were assessed by evaluating the alternatives in relationship to wetland inventory maps and vegetation mapping. The magnitude of the resulting impacts on wetlands was determined based on the potential for wetland acreage loss and the size, integrity, and continuity with other wetlands.

- *Negligible* — No measurable or perceptible changes in wetland size, integrity, or continuity would occur.
- *Minor* — The impact would be measurable or perceptible, but slight. A small change in size, integrity, or continuity could occur due to short-term indirect effects such as construction-related runoff. However, the overall viability of the resource would not be affected.
- *Moderate* — The impact would be sufficient to cause a measurable change in the size, integrity or continuity of the wetland or would result in a small, but permanent, loss or gain in wetland acreage.
- *Major* — The action would result in a measurable change in all three parameters (size, integrity, and continuity) or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable.

### Soils and Vegetation

Impacts were assessed qualitatively. Information on site-specific areas such as Paradise Meadows or on specific resources such as subalpine meadows, general documents such as the park's resource management plan, and site-specific surveys were used.

- *Negligible* — The impact on soils or vegetation (individuals and/or communities) would not be measurable. Ecological processes would not be affected.
- *Minor* — An action would change a soil's profile in a relatively small area, but it would not necessarily decrease or increase the area's overall biological productivity and would not increase the potential for erosion of additional soil. For vegetation, the action would affect the abundance or distribution of individuals in a localized

area but would not affect the viability of local or regional populations.

- *Moderate* — An action would result in a change in quantity or alteration of the topsoil, overall biological productivity in a small area, or the potential for erosion to remove small quantities of additional soil. For vegetation, the action would affect a local population sufficiently to cause a change in abundance or distribution, but it would not affect the viability of the regional population. Changes to localized ecological processes would be of limited extent.
- *Major* — An action would result in a change in the potential for erosion to remove large quantities of additional soil or in alterations to topsoil and overall biological productivity in a relatively large area. For vegetation, the action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population would not be likely to return to its former level (adverse), or would return to a sustainable level (beneficial). Significant ecological processes would be altered, and landscape-level changes would be expected.

### Wildlife

Impacts on wildlife are closely related to the impacts on habitat. The evaluation considered whether actions would be likely to displace some or all individuals of a species in the park or would result in loss or creation of habitat conditions needed for the viability of local or regional populations. Impacts associated with wildlife might include any change in roosting or foraging areas, food supply, protective cover, or distribution or abundance of species.

- *Negligible* — The impact would not be measurable on individuals, and the local populations would not be affected.

- *Minor* — An action would affect the abundance or distribution of individuals in a localized area but would not affect the viability of local or regional populations.
- *Moderate* — An action would affect a local population sufficiently to cause a minor change in abundance or distribution but would not affect the viability of the regional population.
- *Major* — An action would affect a regional or local population of a species sufficiently to cause a change in abundance or in distribution to the extent that the population would not be likely to return to its former level (adverse), or would return to a sustainable level (beneficial).
- *Likely to adversely affect* — The alternative would be expected to directly or indirectly have an adverse effect on the special status species, including listed species. Actions that could be likely to adversely affect species would include direct or indirect mortality of individuals; the removal or damage of nesting, breeding, foraging, or roosting habitats; impacts on food sources; and disturbance of nests during the breeding season. For wildlife, removal of vegetation could adversely affect species if it increased their susceptibility to predation.

### Special Status Species

Through coordination with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Washington Department of Fish and Wildlife, species of special concern were identified that were generally located in or near the park. This included information on each species, including their preferred habitat, prey, and foraging areas. Park staff then collected more specific information such as the absence or presence of each species within the park boundaries. For special status species, including federally listed species, the following impact intensities were used. These terms are used to comply with section 7 of the Endangered Species Act.

- *No effect* — The alternative would have no effect on the special status species, including listed species.
- *Not likely to adversely affect* — The alternative would be expected to have an insignificant, discountable, or beneficial effect on the special status species, including listed species.

### GEOLOGIC HAZARDS

Two methods were used to assess the impacts on public safety that could result from geologic hazards potentially associated with the alternatives. First, existing hazard assessments published by the U.S. Geological Survey and other professionals were used to identify and characterize the hazards at developed sites. Second, field surveys were used to identify features of individual sites, such as height above floodplains and landform type.

Two types of geologic hazards were evaluated, volcanic and nonvolcanic. As noted in the “Affected Environment” chapter, volcanic geologic hazards include debris flows and pyroclastic flows, while nonvolcanic geologic hazards include snow avalanches, rockfalls, and landslides. The impact intensities associated with volcanic and nonvolcanic hazards are defined separately because of the types of events that might occur within the park. For example, at a selected park location, potential public exposure to hazards from a debris inundation flow (volcanic hazard) could be major, while exposure to a nonvolcanic hazard such as an avalanche or rockfall might be negligible.

## Volcanic Hazards

The potential frequency of a debris flow was used to determine the intensity or degree of public exposure to volcanic hazards because debris flows are the primary hazard at Mount Rainier (NPS 1997b). The more frequently a debris flow may occur, or the lower the recurrence interval, the greater the public exposure to geologic hazards. The types of debris flows at Mount Rainier and their recurrence intervals were defined in the “Affected Environment” chapter.

Potential safety hazards may include injury and loss of life. The impact intensities are applied on a site-by-site basis.

- *Negligible* — Visitors and employees would not be directly exposed to the safety hazards of a debris flow.
- *Minor* — Visitors and employees would be exposed to (an adverse impact) or removed from (a beneficial effect) the safety hazards associated with case I or case M debris flows.
- *Moderate* — Visitors and employees would be exposed to or removed from the safety hazards associated with case II debris flows.
- *Major* — Visitors and employees would be exposed to or removed from the safety hazards associated with case III debris flows.

## Nonvolcanic Hazards

The intensity of impacts associated with non-volcanic geologic hazards (snow avalanches, rock falls, and landslides) has been defined as follows:

- *Negligible* — Visitor and employee exposure to avalanches, rock falls, or

landslides would not occur or would not be measurable.

- *Minor* — A minor impact would involve visitor and employee exposure in or removal from areas where the risk of avalanches, rock falls, or landslides would be slight but could occur.
- *Moderate* — A moderate impact would involve visitor and employee exposure in or removal from areas where the risk of avalanches, rock falls, or landslides is readily apparent and well documented through research or historic events.
- *Major* — A major impact would involve visitor and employee exposure in or removal from areas where the risk of avalanches, rock falls, or landslides would be substantial and potentially severe.

## CULTURAL RESOURCES

The assessment of effects on cultural resources was made in accordance with the regulations of the Advisory Council on Historic Preservation for implementing section 106 of the National Historic Preservation Act (36 CFR 800). Native American populations have used various landscapes on Mount Rainier for thousands of years. In addition, the mountain was the site of various exploration, mining, and other commercial ventures during the mid to late 1800s. Evidence of these past land-use practices is preserved in the park's archeological record.

Furthermore, because tribal communities maintain a direct sociocultural relationship to the park, an as yet unknown number of ethnographic resources also are located within park boundaries. Cultural resources and historic properties (whether listed on or eligible for listing on the National Register of Historic Places) can be affected by undertakings that alter in any way the attributes that qualify the

resources for listing on the national register. In accordance with section 106, three possible determinations of effect are used in this impact assessment:

- *No effect* — The undertaking would have no effect, either negative or beneficial, on the historic resource.
- *No adverse effect* — The historic resource could be affected, but the qualities that contribute to its national register significance would not be impaired.
- *Adverse effect* — The integrity of a historic property’s significant attributes would be diminished as a result of such conditions as physical disturbance or alteration, neglect, visual or audible intrusions, or isolation of the property from its historic setting. The effect would be considered adverse when it diminished the integrity of a property’s significant characteristics.

The park’s National Historic Landmark District is fundamentally a comprehensive cultural landscape comprised of diverse historic resources. These resources can be grouped under the broad categories of spatial organization, circulation, topography, vegetation, structures, and buildings.

## VISITOR EXPERIENCE

The visitor experience would be affected by changes in the access to or within the park for visitors; the range of activities available and how enjoyable these activities were; the availability of information; or the character of the wilderness experience:

### Visitor Access

This measure describes how actions such as changes in the supply of parking, the availability of shuttle bus access, and the closure or

opening of roads might affect access to the primary activity areas at the park, or might affect levels of congestion for visitors. Parking or traffic restrictions during construction could cause short-term impacts on visitor access or congestion. Long-term impacts could occur from permanent changes in the parking supply or permanent shuttle bus routes. Beneficial impacts would be associated with an increase in accessibility of a specific area or a reduction in congestion, while adverse impacts would be associated with actions that would reduce the accessibility of an area or increase congestion.

### Range and Enjoyment of Visitor Activities

This measure describes the degree to which actions would change the types or quality of visitor activities or opportunities available in the park. Adverse impacts would be associated with reductions in opportunities for activities or diminishment in visitors’ enjoyment of an activity. Beneficial impacts would be associated with opportunities for additional activities or improvement in visitors’ enjoyment of the available activities. Short-term impacts would be associated with temporary changes associated with construction activities or short-term effects on visitors’ enjoyment of recreation opportunities. Long-term impacts would be associated with permanent changes in facilities or policies that would change recreational opportunities or visitors’ enjoyment of the recreation activities.

### Convenience and Accessibility of Information

This measure evaluates the ease with which visitors could obtain information to plan their visits and interpretive materials to enhance their enjoyment and appreciation of the park’s values. Beneficial impacts would be associated with improved access to information for visitors; adverse impacts would be associated with reduced access to information.

## Wilderness Values and Experience

This analysis addresses the impacts of the alternatives on three wilderness values:

- opportunities for solitude (i.e., the likelihood of not encountering other people while in the wilderness)
- opportunities for primitive and unconfined recreation (i.e., the freedom of visitors to pursue nonmotorized recreational uses in the wilderness)
- naturalness (i.e., absence of evidence of people or their activities)

The following levels were used to assess the impacts of the alternatives on the visitor experience in relation to the above four measures.

- *Negligible* — A negligible effect would be a change that would not be perceptible or would be barely perceptible by most visitors.
- *Minor* — A slight change in a few visitors' experiences, which would be noticeable but which would result in little detracting or improvement in the quality of the experience.
- *Moderate* — A moderate effect would be a change in a large number of visitors' experiences that would result in a noticeable decrease or improvement in the quality of the experience. This would be indicated by a change in frustration level or inconvenience for a period of time.
- *Major* — A substantial improvement in many visitors' experience or a severe drop in the quality of many peoples' experience, such as the addition or elimination of a recreational opportunity or a permanent change in access to a popular area.

## SOCIOECONOMIC ENVIRONMENT

The methods used to determine the potential impacts on the socioeconomic environment varied according to the subjects analyzed. The four major subjects and methods of analysis are as follows:

### Regional Context

Qualitative evaluation of regional economic activity attributable to park visitation changes and associated capital spending on visitor-related facilities and infrastructure.

### Regional Recreation Opportunities

Qualitative evaluation of recreational use patterns of the people in the region and associated impacts on recreation resources.

### Gateway Communities

Qualitative evaluation of economic activity attributable to park visitation changes, and cooperative management practices between the National Park Service and gateway communities.

### Concessioners

Evaluation of changes in providing service, including the potential expansion of services by concessioners and other businesses that provide services in the park. This was a qualitative evaluation of changes to concessioner and other business operations and financial performance.

The analyses of socioeconomic impacts were developed from a review of the local and regional conditions as they relate to the park. The potential for future visitor use, including changes in use patterns, and development were considered.

Socioeconomic effects were recognized as beneficial if, for example, they would increase the employment base or enhance the experience of park visitors (such as from improved services). Impacts were considered adverse if, for example, they would negatively alter employment or park visitors' experience. Impact intensities were as follows.

- *Negligible* — The effect either would be undetectable or would have no discernable effect.
- *Minor* — The change would be slightly detectable but would not have an overall effect.
- *Moderate* — The change would be clearly detectable and could have an appreciable effect.
- *Major* — The impact would be substantial and have a highly positive (beneficial) or severely negative (adverse) effect. Such impacts could permanently alter the socioeconomic environment.

## CUMULATIVE IMPACT ANALYSIS

Cumulative impacts are the effects on the environment that would result from the incremental impact of the action (in this case the adoption of a general management plan for Mount Rainier National Park) when added to other past, present, and reasonably foreseeable future actions. Impacts are considered cumulative regardless of what agency (federal or nonfederal) or person undertook the action.

Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. Each cumulative impact analysis is additive, considering the overall impact of the alternative when combined with effects of other actions (inside and outside the park) that have occurred or would occur in the foreseeable future.

The following aspects of the cumulative impact analysis were similar to all other impact analyses:

- Cumulative impacts were evaluated for type (beneficial or adverse), intensity, duration, and whether they were direct or indirect.
- The measures of intensity (negligible, minor, moderate, and major) that are defined above for each impact topic were used for the evaluation of cumulative impacts.
- The cumulative impact analysis compared the action alternatives to the no-action alternative (continue current management) to identify incremental impacts, rather than comparing them to present-day conditions.

This analysis first involved defining a geographic area to be analyzed. Actions by others that have occurred within this analysis area or would occur in the foreseeable future were then identified. Likely future actions were determined by reviewing the plans and activities of

- local counties and communities
- private timber land owners or managers
- federal agencies such as the U.S. Forest Service and Bureau of Indian Affairs
- the National Park Service within Mount Rainier National Park

From these, the list of projects (often embodied as plans) provided below was developed for consideration in determining cumulative impacts.

### Cumulative Impacts Geographic Area

For most of the impact topics, the cumulative impact analysis area extends approximately 30 to 35 miles in each direction from the park's boundary. This area includes the gateway com-

munities surrounding the park, such as Eatonville on the west, Enumclaw on the north, and Packwood on the south. The area encompasses parts of King, Pierce, Lewis, and Yakima Counties, and includes portions of the Snoqualmie National Forest, Gifford Pinchot National Forest, William O. Douglas Wilderness, Clearwater Wilderness, Tatoosh Wilderness, and Glacier View Wilderness.

For three impact topics, it was determined that a different impact analysis than the one described above gave a better representation of the cumulative impacts.

**Air Quality.** Because air quality impacts affecting the park result from actions throughout the entire airshed, the cumulative impacts area for this topic is the airshed covering the Puget Sound region. Actions that could affect air quality, particularly visibility, in the vicinity of the park were also considered.

**Cultural Resources.** Cumulative impacts for cultural resources were analyzed on a regional basis, generally corresponding to the Puget Sound region. This area was chosen to reflect the highly mobile nature of much prehistoric and historic activity that included occupancy of the Mount Rainier area primarily in the summer.

**Socioeconomic Environment.** Cumulative impacts for the socioeconomic environment were analyzed for King, Pierce, Lewis, and Yakima Counties. This four-county area surrounding the park corresponds to the area used in previous studies of the park's economic effects and recognizes that the socioeconomic effects of park actions extend even beyond the gateway communities.

### County/Community Plans and Activities

**Pierce County Comprehensive Plan** (Pierce County 1999a). Most of the land surrounding the park is designated as forestland as part of

the land use element of this plan. Lands along State Route 706 and bordering the Nisqually entrance to the park are designated as rural 10, which allows a density of 1 residential unit per 10 acres, with a maximum of 2.5 units per 10 acres if 75% of the site is designated as open space. This designation will help prevent high-density development and maintain the rural character on the western side of the park.

**Supplemental Environmental Impact Statement for the Upper Nisqually Valley Community Plan** (Pierce County 1999b). The area encompassed by the plan shares a portion of the park's southwestern boundary and includes the gateway communities of Alder, Elbe, and Ashford. The plan amends the Pierce County *Comprehensive Plan* by setting forth planning and land use policies and alternative growth scenarios that will direct future land use decisions in the upper Nisqually area.

The plan outlines several elements and visions for the area. Growth will be directed into community-planned centers to maintain the rural character of the valley. Diversification of the economic base and the promotion of tourism, sustainable forestry, and coordination and marketing of recreational lands and resources will be encouraged. The resulting need for infrastructure and services will also be accommodated. To protect against the effects of growth, important viewsheds are to be preserved, as are historic resources, critical natural areas, and natural vegetation. Impacts from waste disposal, air quality, and pesticide use will also be addressed.

The provisions outlined in the plan could both attract additional population and recreational growth into the southwest area of the park and provide some of the necessary controls to prevent environmental impacts related to this growth.

**Mount Rainier Resort at Park Junction** (David Evans & Associates 1999). The Mount Rainier Resort at Park Junction is a proposed

440-acre destination conference center resort on State Route 706, approximately 12 miles west of the Nisqually entrance and adjacent to the park administration facility at Tahoma Woods. The resort is targeting convention conferencing business and proposes a range of services and facilities, including a 270-room lodge with a conference center for 500 people, a retail village, a golf course, a tennis and spa center, a train station interpretive center (which would serve the proposed Train to the Mountain from Tacoma), 400 vacation homesites and condominiums, and support facilities, such as maintenance, sewage and water treatment plants, and housing for more than 200 employees. Peak population of permanent residential and overnight guests is 1,500, with 85,000 visitors projected annually. Construction of the resort is expected to be finished by 2011.

Following extensive hearings, Pierce County recently approved rezoning the area to allow a resort. Also, to mitigate impacts on the park and local communities, there will be conditions on the resort's permit that require the developer to provide an off-site visitor welcome center for the park in the State Route 706 corridor and to provide a shuttle service for resort guests to the park.

**Train to the Mountain.** For several years, a Train to the Mountain has been considered that would link Tacoma with the Elbe and Ashford area. The City of Tacoma currently holds rights as the owner and operator of the system. Once funding was found for the project, the 57 miles of railroad tracks between Tacoma and Ashford would be upgraded to allow train speeds of about 30 miles per hour, and would offer a one-way trip time of two hours.

The Train to the Mountain would be established as an excursion railroad, with connecting bus service to Mount Rainier and other regional attractions. Potential riders would include local residents, tourists, and convention and meeting attendees. It is estimated that ridership would range from about 40,000 to

52,000 riders annually within the first five years and would rise to 86,000 within a 15-year planning horizon.

**Chinook Byways Corridor: Planning and Management Guidebook and Action Plan** (Otak Inc. 1999). This corridor plan covers the segment of State Route 410 that extends from east of Enumclaw to the beginning of Mather Memorial Parkway, 4 miles east of Greenwater. This portion of the state highway runs through both public and private forested lands, as well as through the historic community of Greenwater. The *Chinook Byways Corridor Planning and Management Guidebook* was completed to describe existing conditions and important qualities, provide guidance for solving problems, and provide a starting point for future corridor planning, management, and implementation.

An action plan outlines projects, programs, strategies, and ideas for achieving the vision for the corridor. Suggested actions of relevance to the Mount Rainier general management plan include the following proposals:

- expanding the organization to include interests and stakeholders for the entire State Route 410 road corridor, from Enumclaw through the park to Naches, which would take in the area designated in 1998 as an "All American Road" in the national scenic highway program
- implementing an interpretive program
- coordinating with the Washington Department of Transportation to complete an updated transportation and traffic analysis
- developing recreational opportunities along the corridor

Well-planned constructive improvements along State Route 410 could enhance the experience of visitors using this road corridor to travel to and through Mount Rainier

National Park by providing new visitor services, improved interpretive opportunities, and additional recreation opportunities.

**Mount Tahoma Trails System.** The Mount Tahoma Trails system consists of 100 miles of hut-to-hut cross-country skiing on snow-covered logging roads. It is a partly connected system of ski trails located in Elbe Hills Forest, Tahoma State Forest, privately owned timberland, and the Mount Baker-Snoqualmie National Forest. The trails are open to hiking, bicycling, skiing, and snowshoeing.

The Mount Tahoma Trails Association (MTTA) has a cooperative agreement with the Washington Department of Natural Resources, the U.S. Forest Service, Rainier Timber Company, LLC, and Mount Rainier National Park. The association and the Department of Natural Resources are promoting all-season use of the trail network on the west side of Mount Rainier for hikers, bikers, and skiers.

### **Private Timber Lands**

The Plum Creek Timber Company, the U.S. Forest Service, and eight environmental organizations reached an agreement in November 1999 to complete the I-90 land exchange in central Washington. The resulting agreement will result in an exchange of 31,713 acres of Plum Creek Timber Company land within the boundaries of the Wenatchee and Mount Baker-Snoqualmie National Forests for 11,556 acres of U.S. Forest Service land in the Wenatchee, Mount Baker-Snoqualmie, and Gifford Pinchot National Forests.

The revised land exchange protects large ecosystems containing important habitat for fish and wildlife and will also preserve recreational opportunities for state residents. The results of the exchange are an increase in public ownership of 8,000 acres of old-growth forests and 20,000 acres of roadless lands. More than 25 miles of well-known hiking trails

are added to public ownership, and some of the state's most scenic areas are protected. These include four roadless, old-growth-forested valleys near the Alpine Lakes Wilderness (Scatter Creek, Silver Creek, Domerie Creek, and the West Fork of the Teananway River). A 15,000-acre area bordering the Alpine Lakes Wilderness will be evaluated for potential addition to the wilderness system.

This land exchange will enhance biological connectivity between the North and South Cascades by increasing the amount of public land on both sides of I-90. Such preservation of lands, in combination with existing federal lands, will help address the problems of wildlife habitat fragmentation that have threatened to isolate wildlife populations.

### **Adjacent National Forests**

**Crystal Mountain Ski Area (Mount Baker-Snoqualmie National Forest)** (Sno-Engineering, Inc. n.d.). The Crystal Mountain ski area is north of State Route 410, about 21 miles east of Greenwater and adjacent to Mount Rainier's eastern wilderness boundary. Current facilities include downhill ski runs, chair lifts, three restaurants, a bike rental store, a recreation center, gift and grocery stores, two hotels, and private condominiums. Visitor activities include skiing in winter and hiking and mountain biking in summer.

The ski area, which operates under permit in the Mount Baker-Snoqualmie National Forest, is proposing a new master plan to allow increased development and additional recreational opportunities. The main focus of the expansion is to promote and enhance ski services, with some emphasis on summer (off-season) use. The draft master development plan / environmental impact statement is scheduled for public review in the summer of 2001, with a record of decision expected in December 2001.

The proposed master plan (alternative 2) calls for increasing skiers at onetime from 7,150 to more than 10,990, expanding the ski area from 450 acres to 714 acres, and authorizing more night skiing. To support this increased ski capacity and offer year-round recreational opportunities, new facilities would be developed, including 10 new chair lifts, a 100-passenger aerial tram, new housing for employees, a new hotel, an ice-skating rink, and a conference center. Capacity would be increased by expanding the hotel, the ridgetop restaurant, and parking areas. Both the tram and the restaurant would operate year-round. The restaurant and conference area would be near the ridgetop that defines the park's northeast boundary. One of the new chairlifts would be on an undeveloped peak adjacent to the park, Silver King Mountain. Another new lift would be constructed into Morning Glory Basin, also adjacent to the park.

The resort expansion is to be finished by 2013. Total annual visitation under the owner's preferred alternative would be 748,000 (83% of which are winter users) versus 437,000 users currently (of which 95% are winter users).

**Carbon River Bridge Replacement (Mount Baker-Snoqualmie National Forest)** (USFS 1999d). After a flood destroyed the Carbon River bridge serving the Copley Lake / Clearwater Wilderness, just outside the Carbon River park entrance, the Forest Service decided to replace the bridge. A categorical exclusion was prepared, and consultations with the Washington State Department of Fish and Wildlife and U.S. Fish and Wildlife Service have been completed. A permit has been obtained from the U.S. Army Corps of Engineers to remove the diking and other stream restrictions of the old bridge.

The replacement bridge will be multi-span, with a length of approximately 800 linear feet. It will not have the numerous stream restrictions that were characteristic of the old bridge.

It will be single-lane wide with a pullout in mid-span that will provide pass-by opportunity. The current schedule is to start work on the new bridge in the summer of 2001. When the bridge is completed it will reinstate recreational opportunities in this portion of the Snoqualmie District of the Mount Baker-Snoqualmie National Forest.

**Wilderness Resource Protection Project (Gifford Pinchot National Forest)** (USFS 1999b). A decision notice and "Finding of No Significant Impact" was issued in April 1999 for a wilderness resource protection project that evaluated and amended wilderness management strategies for seven wilderness areas that fall within the forest. The alternative selected amends the *Forest Plan Standards and Guidelines* for Gifford Pinchot National Forest wilderness areas, implements a restrictive permit system for climbing Mount Adams and overnight camping in all Gifford Pinchot National Forest wilderness areas, and implements limited campsite designations in environmentally sensitive areas and/or heavily impacted wilderness areas. The goal is to provide an effective and administratively feasible means of protecting and restoring wilderness resource conditions without excessive closures and restrictions. Permitted use levels in each wilderness area would depend on information gathered through resource monitoring.

**Bronze Billy Timber Sale (Gifford Pinchot National Forest)** (USFS 2000). An environmental assessment is being prepared for the thinning and regeneration harvest of 1.4 million board feet of timber approximately 4 miles east of Ashford (T15N, R7E, sections 28, 29, and 32) near the Nisqually entrance to the park. Alternative development and analysis for the environmental assessment currently is underway.

**Campground Reconstructions at Soda Springs, Lodgepole, Halfway Flat, Pleasant Valley, and Bumping Lake Campgrounds (Wenatchee National Forest)**. Planning and

execution for a program to upgrade camp-ground facilities, including access roads, toilets, picnic tables, fire rings, and shelters, is underway. These facilities are in the American / Bumping River drainage east of the park and south and east of State Route 410.

### **Bureau of Indian Affairs**

The Muckleshoot Indian Tribe is proposing the development of a 20,000-seat open-air amphitheater within the boundaries of their reservation, approximately 35 road miles from the northwest (via State Route 164 and 165) and northeast (via State Route 164 and State Route 410) quadrants of Mount Rainier National Park (BIA and WDOT 1999). This facility would serve as a performing arts center for the greater Puget Sound outdoor concert market, and as a cultural center for the tribe. The 95-acre site would be located on deposits from the Osceola Mudflow and would include up to 7,300 surface parking spaces, driveways, internal roads, landscaping, and a mitigation area. The facility would have a fairly short season, ranging from 25 to 40 concerts, primarily on weekends and during evening hours (Bureau of Indian Affairs and Washington Department of Transportation 1999). The amphitheater's median annual attendance is estimated at 310,800.

The final environmental document and record of decision for this project are pending. It is estimated that the amphitheater would be completed within two years following approval of the environmental impact statement.

### **Mount Rainier National Park Actions**

The following actions undertaken by the park in the past were considered as part of the cumulative projects:

- replacing Paradise dormitory (NPS 1995d)
- rehabilitation of Carbon River Road (NPS 1998a)
- rehabilitation of the National Park Inn
- replacing Laughingwater Bridge and Deadwood Creek Bridge (NPS 1992d; NPS 1992e)
- constructing the Grove of the Patriarchs boardwalk (NPS 1999g)
- establishing the National Historic Landmark District (NPS 1997d)
- rehabilitating State Route 410 (Mather Memorial Parkway) (NPS 1997c)

The following future actions to be undertaken by the park were considered as part of the cumulative projects:

- replacing the White River Entrance station (NPS 2000d)
- rehabilitating the Paradise Guide House
- replacing Sunrise Lodge (NPS 1992b)
- stabilizing and improving Camp Muir
- rehabilitating the Stevens Canyon viaduct
- rehabilitating State Route 123 and State Route 410
- completing natural and cultural resource studies and management actions

## ALTERNATIVE 1: NO ACTION

### IMPACTS ON NATURAL RESOURCES

#### Air Quality

**Analysis.** Under the no-action alternative (continue current management), the park staff would continue to work with its partners to maintain and improve the air quality of the park and region. For example, concession employees and many park staff would continue to take shuttles during peak-use periods. However, no new efforts would be initiated to reduce pollution levels or minimize the effects of in-park pollution sources on air quality.

Visitor use is expected to increase slightly. Increased visitation would result in slight increases in vehicle miles traveled within the park, which would cause increased vehicular exhaust, and slight increases in the numbers of campfires, which would cause increased emissions of particulates, carbon monoxide, and volatile organic compounds. Therefore, alternative 1 would have a minor, adverse impact on local air quality.

**Cumulative Impacts.** Cumulative effects on air quality are considered on a regional basis, and pollutants from the Puget Sound region and areas to the south would continue to affect air quality in the park to a much greater degree than would park activities. In particular, sulfur dioxide generated from the Centralia Power Plant contributes to air quality degradation within Mount Rainier National Park. The installation of scrubbers at this plant is expected to reduce sulfur dioxide emissions by 90% from the previously allowable limit by the year 2003, which would improve regional air quality.

Forest fires would contribute large amounts of particulates for limited periods of time, generally during the summer and fall. Forest

fires would continue to have major, short-term, adverse impacts on regional air quality.

Actions outside the park, such as the proposed Mount Rainier Resort at Park Junction and Crystal Mountain ski area, would increase vehicle miles traveled in the region, and result in increased vehicular and railway exhaust. Dust and pollutants from logging activities, pollutants from campfires in the surrounding recreational areas, and from slash burning are expected to continue. These sources would contribute to a moderate adverse impact on regional air quality and to a major adverse impact on visibility.

The proposed Train to the Mountain could reduce the number of vehicle miles driven by visitors to the park, and therefore would reduce the amount of vehicle emissions. This would contribute to a slight improvement in regional air quality and, therefore, would be a minor beneficial impact.

In the long term, local planning efforts to manage and control growth and development, such as the *Pierce County Comprehensive Plan* and the *Upper Nisqually Valley Community Plan*, could have a minor beneficial effect by limiting the extent of new development and reducing the amount of pollutants from vehicle emissions and new stationary sources. However, these plans would not diminish the effects of currently planned developments.

Other actions within the park such as restoration activities and rehabilitation of buildings would cause localized increases in dust and emissions from construction vehicles and equipment. This would result in temporary effects on air quality. These effects would be localized and mitigated to the extent possible. The impacts on air quality, although adverse, would be short-term and minor.

When the effects of actions by others and other actions in the park are combined with actions associated with this alternative, the cumulative effect of all of these actions would be a minor, long-term, adverse impact on air quality, and the cumulative air quality impact on visibility would be adverse and minor to moderate.

These impacts would be primarily due to the effect of pollutants from the Puget Sound region and areas to the south of the park. This alternative's contribution to these cumulative impacts would be minor.

**Conclusion.** The no-action alternative would result in a minor impact on local air quality, due to slight increases in pollutants from vehicle exhaust and campfires. Cumulative impacts would include minor, adverse impacts on regional air quality, and minor to moderate, adverse impacts on regional visibility. This alternative's contribution to these cumulative, regional impacts would be minor.

### Water Resources and Water Quality

**Analysis.** Minor, long-term, adverse impacts on water quality would result under alternative 1, due to slight increases in levels of sediment, pollutants, and nutrients in the water. Minor impacts on the clarity of water in Mowich Lake from roadway runoff also would be expected. These effects would be associated with increased visitor use of the park.

Visitor uses such as camping, hiking, and horseback riding would increase slightly and would continue to have localized, indirect effects on water quality due to increased soil compaction, vegetation trampling, and ultimately the loss of vegetation in some areas. These effects would lead to greater erosion and the addition of sediment to adjacent waters. The nature and extent of soil compaction and vegetation damage and, therefore, of related impacts on water quality, would depend on the type of local soils, vegetation, and topography, as well as the areal extent, duration, and

intensity of use (USFS 1985). However, sedimentation effects generally would be slight in comparison to the natural sedimentation occurring as a result of spring snowmelt, summer and fall runoff from precipitation, or flood flows on glacially influenced rivers and streams. Therefore, sedimentation-related impacts on water resources would be negligible to minor.

The increased use of unpaved roads could make these facilities more susceptible to surface erosion and runoff. Vehicle use along roads and in parking lots would continue to deposit petroleum products that could be washed into adjacent waters. Increased overflow parking along roads would increase the potential for erosion of road shoulders and the resulting sedimentation. Impacts would generally be minor due to mitigation techniques such as placement of sediment traps and/or biofiltration (vegetation filtration) along roadsides. Dust and sediment runoff from increased traffic on Mowich Lake Road would contribute to reduced clarity of the lake. However; the increased volume of sediment would be slight and the impact, although adverse, would be minor.

Roads that are subject to flood inundation and repeatedly need repair, such as Westside Road and Carbon River Road, would continue to produce multiple incidents of adverse impacts on water quality and water resources due to sediment runoff into adjacent waters. In most cases, these adverse impacts would be minor and short-term.

Improper disposal of untreated human waste in areas without toilet facilities currently causes minor water quality problems. Under the no-action alternative, this problem would increase proportionally with increased human use of the park.

Because winter visitor use in the park is low and future increases in visitation would be slight, winter use would have few impacts.

Visitors are encouraged to participate in camping and other activities only in areas where the snow is at least 2 feet deep. To the extent that this policy is ignored, an inadequate snow cover could result in soil disturbance and loss of protective vegetative cover, which could cause localized soil erosion and sedimentation, resulting in minor adverse impacts.

**Cumulative Impacts.** Actions outside the park would result in minor to major, adverse effects on water quality due to increased loading of sediment, nutrients, and pathogens.

- Logging and timber harvesting would have moderate to major short-term adverse effects on water quality. These would result from sediment entering rivers that originate within the park. For example, the Nisqually River would be affected by the U.S. Forest Service's planned Bronze Billy timber sale, and the Carbon River would be affected by private timber harvesting. Although the impacts at each site would be last only a few years until a vegetative cover was reestablished, the continuous cycle of timber harvest would result in a moderate to major, long-term, adverse impact on the region's water quality.
- Runoff from other proposed developments, including Mount Rainier Resort at Park Junction and expansion of the Crystal Mountain ski area, would have minor long-term adverse impacts on water quality in local rivers such as the White and Nisqually Rivers. These impacts would occur as small amounts of sediment, pollutants, and nutrients entered the rivers from the developed areas.

In the long term, local planning efforts to manage and control growth and development, such as the *Pierce County Comprehensive Plan* and the *Upper Nisqually Valley Community Plan*, could have a minor beneficial impact by providing additional protection for water quality and water resources. They might

also limit the extent of new development in the region. However, these plans would not diminish the effects of currently planned developments.

Watershed restoration projects on national forest lands, including the decommissioning and revegetation of some roads, would reduce the entry of sediment into local waters. This would affect small, localized areas and would have a minor beneficial effect.

Past and reasonably foreseeable projects undertaken within the park that would affect water resources include construction of the Grove of the Patriarchs boardwalk and the replacement of Sunrise Lodge. These actions would continue to have minor short-term adverse impacts on water quality resulting from small increases in sediment and other pollutants. Continued adherence to best management practices would ensure that the impacts were minor.

When the effects of actions by others and other actions in the park are combined with impacts associated with this alternative, the cumulative impacts would be major to moderate, long-term, and adverse in the region, primarily because of the effects of logging and land development outside the park.

This alternative's contribution to the cumulative impacts would be minor. This would occur because of the National Park Service's mandate to protect resources within the park and its commitment to mitigate even minor water quality impacts through such measures as trail maintenance and reconstruction.

**Conclusion.** Increasing visitor use in the park would have a minor adverse impact on resources and water quality by increasing levels of sediments, vehicle-related pollutants, and nutrients in lakes and streams. Most of these effects would be localized. There would be major to moderate long-term adverse cumulative impacts in the region, primarily because

of pollutant loads in runoff associated with logging and land development outside the park. This alternative's contribution to these adverse cumulative, impacts would be minor.

## **Floodplains**

**Analysis.** Alternative 1 would have minor to moderate adverse impacts on floodplain values for the Nisqually River and minor adverse impacts for the Carbon River. These effects would be associated with the continued need for maintenance of existing levees, road reconstruction, and streambank protection.

No new developments would occur in regulatory floodplains in this alternative. Therefore, only current and ongoing conditions at developed areas that are in or near floodplains have been evaluated.

Both Longmire and the Sunshine Point campground are outside the regulatory floodplain for precipitation-related events. Flooding along the Nisqually River in the 1950s was a result of outburst flood activity from the Nisqually Glacier when a massive amount of water was suddenly released from the glacier. Because outburst flooding from the glacier has decreased over the past few decades, the probability that these areas would flood from such an event is small. However, continued sediment deposition in the existing Nisqually River channel could cause higher flood elevations and continued erosion of the levees protecting these areas.

Because the levees are within the regulatory floodplain, levee maintenance and streambank protection would have long-term adverse impacts on floodplain values by continuing to alter the path of natural river flows and adversely impacting riparian soils and vegetation. These would be moderate at Longmire because it involves a longer stretch of the river, and minor at Sunshine Point because it affects a small portion of the river. Similarly, ongoing

operation of the Ipsut Creek campground would have minor adverse impacts on floodplain values.

Under the no-action alternative, Westside Road and Carbon River Road would continue to be reconstructed each time they washed out. Continuing bank protection, channel manipulation, and repair activities could interfere with natural river processes in multiple sections of streams and rivers in the park and would have long-term, moderate, adverse impacts on floodplain values on the Carbon River, Tahoma Creek, Fish Creek and the South Puyallup River.

All the facilities at the Carbon River entrance, including housing and the ranger station, are inside the 100-year regulatory floodplain. Therefore, their continued use would have a minor adverse effect on the floodplain.

**Cumulative Impacts.** There are numerous projects on private and national forest lands that could affect floodplains in the Nisqually and Carbon River drainages. Ongoing commercial logging activities and associated road developments have had moderate impacts on floodplains and river processes in the area. Permanent roads developed to access the forested areas cross floodplains and have created permanent alterations that affect floodplain values. Impacts on the Nisqually and Carbon Rivers from these activities are long-term, adverse, and moderate.

The U.S. Forest Service's planned Carbon River Bridge Replacement project could affect the floodplain in the immediate area of the Carbon River along Forest Road 7810 during construction. This would result in minor, short-term, adverse impacts. Watershed restoration projects on national forest lands, including the decommissioning of some roads, would result in positive effects on floodplain values by reducing long-term impacts on some floodplains. However, the area affected would be

relatively small, resulting in a minor beneficial effect.

In the long term, local planning efforts to manage and control growth and development, such as the *Pierce County Comprehensive Plan* and the *Upper Nisqually Valley Community Plan*, would have a minor beneficial impact by providing additional protection for floodplains in the region. However, these plans would not diminish the effects of currently planned developments.

Other actions by the National Park Service that would affect floodplains in the park primarily include road rehabilitation, such as the rehabilitation of Carbon River Road. These types of projects, which require manipulation of riverbanks, produce minor short-term adverse impacts on floodplain values and river processes.

When the effects of actions by others and other actions in the park are combined with impacts associated with this alternative, there would be a moderate long-term cumulative adverse impact on floodplains, primarily because of the effects of maintaining logging roads on private and public lands outside the park. This alternative's contribution to these adverse cumulative impacts would also be moderate, because of the multiple sections of floodplains in the park that would be involved.

**Conclusion.** This alternative would result in minor to moderate long-term adverse impacts on floodplain values along relatively small sections of several rivers and streams. The impacts would occur due to ongoing levee maintenance and riverbank protection. Cumulative effects would include moderate long-term adverse impacts on floodplains because of actions outside of the park. This alternative's contribution to these cumulative impacts would also be moderate.

## Wetlands

**Analysis.** There would be no impacts on wetlands under this alternative. No actions are proposed under this alternative that would directly affect wetlands, and existing practices that prevent indirect impacts on wetland areas would continue.

**Cumulative Impacts.** Wetlands on both public and private lands in the vicinity of the park have been extensively modified by logging and developments. Past NPS actions also have modified wetlands in the park. Although long-term effects on wetlands must be mitigated through wetland restoration or the creation of replacement wetlands under the Clean Water Act, there still has been a moderate adverse long-term cumulative impact on wetlands in the region. Alternative 1 would not contribute to this cumulative impact.

**Conclusion.** This alternative would not cause any impacts on wetlands. Although there would be a moderate adverse long-term cumulative impact on wetlands in the region, alternative 1 would not contribute to this impact.

## Soils and Vegetation

**Analysis.** Throughout most of the park, increased visitor use associated with alternative 1 would result in negligible to minor long-term adverse impacts on soils and vegetation. Moderate long-term adverse impacts would occur in high-use areas.

Visitor uses such as camping, hiking, and horseback riding would increase slightly and continue to have localized effects on soils and vegetation. In undisturbed areas, human trampling would bend or break aboveground plant parts. Trampled vegetation makes a site easily recognizable as an informal (social) trail or campsite, often causing human use to escalate. Repeated use of these newly disturbed

areas, as well as previously disturbed areas, would result in vegetation loss followed by soil compaction and erosion. Social trails on sloping hillsides would act as channels for surface water runoff, resulting in soil erosion.

The nature and extent of vegetation loss and soil compaction under the no-action alternative would depend on the amount, timing, type, and location of use. For example, soils and vegetation are most susceptible to damage during spring when soils are water-saturated and prone to disturbance, and when plants are initiating growth. Due to the short growing season in the park, many plant species are unable to generate new growth following trampling, and vegetation loss occurs quickly. In high-use areas, this plant mortality would result in continued degradation even after recreational use ceased.

In some high use areas, such as Paradise Meadows or Spray Park, there would be moderate adverse impacts, as repeated trampling resulted in high plant mortality and increased erosion potential. In problem sites, the park staff would continue attempts to prevent and reduce impacts and to restore damaged sites. However, current efforts would not prevent or reduce all impacts under current visitation levels. Thus, increased impacts are expected as visitation increases.

In other areas of the park, there would be negligible to minor adverse impacts on vegetation as relatively few plants in small areas were affected. The potential for soil erosion in these areas would not increase.

Increased visitor use might also help spread exotic (nonnative) or noxious species — from seeds carried into the park on vehicles, pack stock, clothing, maintenance equipment, and other materials. Impacts would range from minor to moderate, depending on the type of plant and where it was introduced. Moderate impacts would occur if a local population of a species or plant community was sufficiently

affected to cause a change in its abundance or distribution.

Dust and pollutants from motor vehicles in the park would increase slightly and continue to affect vegetation adjacent to roadways by interfering with plant respiration and causing chlorosis in leaves. Increased parking by visitors in vegetated areas along roads would cause loss of vegetation, which would contribute to soil erosion and might lead to invasion by noxious weed species. Because these effects would be localized and occur in previously disturbed areas, the impacts would be negligible to minor.

In winter visitors are encouraged to participate in winter wilderness camping only in areas where snow is at least 2 feet deep. To the extent that the policy is ignored, increased use could increase soil erosion during snowmelt and retard sensitive new vegetation growth as the snow receded. However, because these effects would be localized, impacts would be minor.

**Cumulative Impacts.** Actions outside the park have resulted in, and would be likely to continue to result in, minor to major long-term adverse effects on soils and vegetation in the vicinity of the park, such as the Carbon River valley. In particular, logging and commercial and housing developments on lands outside the park boundary have had (and would continue to have) edge effects on vegetation and soils along the park boundary, such as soil erosion and changes in species composition due to windthrow, changes in the light regime, and infestations of nonnative plants.

The expansion of the Crystal Mountain ski area is expected to increase summer and winter use of the adjacent park area. Although mitigating measures should help reduce impacts, increased trampling of vegetation and the establishment of social trails still would be likely to occur.

In the long term, local planning efforts to manage and control growth and development, such as the *Pierce County Comprehensive Plan* and the *Upper Nisqually Valley Community Plan*, could have a minor beneficial effect to the extent that they limited new development in the region. However, these plans would not diminish the effects of currently planned developments.

Watershed restoration projects on national forest lands, including the decommissioning and restoration of some roads, would reduce the potential for soil erosion. Because these actions would affect small, localized areas, their long-term beneficial effects would be minor.

Past and reasonably foreseeable projects undertaken in the park that would affect soils and vegetation include replacing the Paradise dormitory and the White River entrance station. These actions would continue to cause minor short-term adverse impacts on soils and vegetation because of their small sizes, the use of best management practices to control soil loss during construction, and prompt revegetation after their completion.

When the effects of actions by others and other actions in the park are combined with impacts associated with this alternative, the impact of all of these actions would be likely to result in minor to major long-term cumulative adverse impacts on soils and vegetation in the region, primarily because of the effects of logging and land development outside the park.

This alternative's contribution to the cumulative impacts would be minor because of the relatively small areas of soils and vegetation in the park that are disturbed and the National Park Service's commitment to ensuring the protection of soils and vegetation as an integral component of the park.

**Conclusion.** Increased visitor activities mostly would result in localized minor long-term

adverse impacts on soils and vegetation, with moderate impacts in some high-use areas such as Paradise Meadows and Spray Park. Impacts would include trampled vegetation, loss of plants, spreading of exotic species, and increased soil erosion. There also probably would be minor to major long-term cumulative adverse effects on vegetation and soils in the region, primarily due to logging and land development. This alternative's contribution to these cumulative impacts would be minor.

### Wildlife

**Analysis.** Alternative 1 impacts on wildlife would be adverse and would range from negligible to minor. These effects would be caused by increased recreational activity and vehicular traffic associated with slight increases in visitor use.

Most visitor use is concentrated in nonwilderness areas, along wilderness trails, and at wilderness campsites. Increased human presence in these areas might disturb wildlife. However, because these areas already are heavily used, it is doubtful that slight increases in human activity would further impact wildlife and wildlife habitat in these areas. Wildlife sensitive to human use already avoid these areas, and animals that do inhabit such locations would be accustomed to human use and would not be further impacted by additional human habitation. To the extent that wildlife were disturbed, it would be temporary (lasting only until visitors passed by) and would not affect local or regional populations. Therefore, the impacts, although adverse, would be negligible.

Increased use would cause a proportional increase in improper food storage by visitors. Food and garbage left out attracts wildlife, resulting in animals associating food with people and possibly causing human-wildlife conflicts. Some visitors would continue to feed wildlife, which would also condition wildlife

to associate humans with food. Existing wildlife management practices, such as providing wildlife-resistant garbage cans and food storage sheds and educating visitors, would continue to be implemented, resulting in negligible to minor impacts.

Wildlife are occasionally injured or killed by motor vehicles on park roads, and this impact might increase slightly with additional motor vehicle travel. These adverse impacts would be minor, because they would affect individuals, but not entire populations.

In winter, visitor-use impacts on wildlife would be negligible because visitor use in winter would increase only slightly, and would continue to be low.

**Cumulative Impacts.** Actions outside the park would result in minor to major long-term adverse effects on wildlife. Many of these effects would be associated with the conversion of wildlife habitat to commercial and residential development. Additionally, land development would fragment remaining habitat, making it unsuitable to support species that are sensitive to the presence of humans.

Except for species that rely on large tracts of mature or old-growth forests, the effects of timber harvesting in already roaded areas would be short-term, adverse, and minor to moderate. Animals would be displaced during timbering operations, and the land would have a lowered ability to support wildlife until vegetation was reestablished. Thereafter, the creation of “edge” and early successional stages would improve the habitat for many wildlife species, including game animals such as deer and elk.

Logging would cause long-term major adverse effects on species that rely on large tracts of mature or old-growth forests because timbering would produce long-term habitat loss. Long-term major adverse effects would result from timbering in unroaded areas because the

logging roads would open these areas to increased human disturbance. These effects could be reduced or eliminated if the roads were permanently closed and revegetated after logging was completed.

In the long term, local planning efforts to manage and control growth and development, such as the *Pierce County Comprehensive Plan* and the *Upper Nisqually Valley Community Plan*, could have a minor beneficial effect by limiting the extent of new development that could disrupt or remove wildlife habitat. However, these plans would not diminish the effects of currently planned developments.

Other actions in the park that could affect wildlife are the replacement of bridges and the rehabilitation of the Stevens Canyon viaduct. Effects during construction would be minor, short-term, and adverse. Habitat restoration after completion would prevent long-term effects.

When the effects of actions by others and other actions in the park are combined with impacts associated with this alternative, the cumulative impacts would be minor to major, long-term, and adverse, primarily because of the effects of logging and land development outside the park.

This alternative’s contribution to the cumulative impacts would be minor because the adverse effect within the park would be small and because of the large area of habitat loss or degradation that would occur outside of the park.

**Conclusion.** Increased visitor activities associated with alternative 1 would cause negligible to minor long-term adverse impacts on wildlife. Impacts would be associated with increased visitor use displacing or disturbing wildlife, conditioning wildlife to associate food with people, and injuring or killing wildlife in collisions with motor vehicles. Cumulative effects would include minor to

major long-term adverse impacts, primarily through habitat loss associated with logging and land development outside the park. This alternative's contribution to these cumulative impacts would be minor.

### Special Status Species

**Analysis.** Alternative 1 would not be likely to adversely affect any special-status species. However, some inconsequential changes to habitat or loss of individuals might occur, as described below.

Site-specific surveys would be conducted before implementing specific actions to determine if special-status species existed in the project area. If any were located, the National Park Service would consult with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Washington Department of Fish and Wildlife, and the Washington State Department of Natural Resources to determine mitigation measures to avoid or minimize adverse impacts on the species.

The potential effects on most special-status species from the implementation of alternative 1 would be associated with increased human use of the park. The following analysis is arranged by groups of species with similar habitat requirements.

Marbled murrelet, northern spotted owl, and northern goshawk — Although their feeding or foraging habits vary, these three species all nest in mature or old-growth forests within the park. Alternative 1, which would continue to protect these forest types, would not be likely to adversely affect these species.

Most of the park's 22,000 acres of murrelet habitat and 68,000 acres of northern spotted owl habitat would receive little additional human use, and the number and frequency of human-related impacts would remain low. Current

management practices that would continue under alternative 1 include protecting identified spotted owl or marbled murrelet nest sites from human impacts.

The slight increases in human noise and activity that would be associated with increased visitor use could displace or disturb some individual birds. Increased human uses, particularly in picnic and camping areas, could result in an increase in jays, crows, and magpies, which prey on nestlings and eggs of northern spotted owls, marbled murrelets, and goshawks. However, breeding murrelets may be less affected than the other two species because their nests are well hidden 100 feet or more above the ground.

Bald eagle, peregrine falcon, and ferruginous hawk — The bald eagle and ferruginous hawk are transient and do not nest within the park, so there would be no effect on these species. Peregrine falcons have been found nesting in the southwest area of the park, but they would not be affected by actions under alternative 1.

Olive-sided flycatcher — This species, which is known to breed in the park, would not be likely to be adversely affected under alternative 1. The olive-sided flycatcher prefers forest edges adjacent to open areas, such as burns, montane meadows, and subalpine parklands. This habitat would remain relatively undisturbed by actions under this alternative. Although increased human noise and activity could continue to displace or disturb individual birds near trails, campsites, and other activity areas, the impacts would be minimal and localized.

Canada lynx, gray wolf, grizzly bear, California wolverine, and pacific fisher — It is unlikely that any of these species of carnivorous mammals currently inhabit the park. Grizzly bears have never been documented in the park, lynx and wolves have not been documented since the 1920s, wolverines have not been documented since 1933, and fishers have not been documented since 1947. Therefore, these species would not be affected by the no-

action alternative (continue current management).

Reestablishing some of these species in the park has been discussed and could be considered under alternative 1. All these species require large expanses of land relatively free from human use. Increases in human use in alternative 1 might be expected to reduce the amount of suitable habitat. However, human use in the park is likely to continue primarily in nonwilderness areas and along trails and at designated campsites in the wilderness areas. Therefore, increased use would have little effect on the habitat preferred by these species.

Long-eared myotis and long-legged myotis — These bat species roost in caves, rock crevices, abandoned buildings, and trees. They forage in forests and open areas at night. This alternative would not be likely to adversely affect these species because it would not include any actions that would disturb roosting sites or foraging habitat, or that would disrupt their overnight activity.

Pacific Townsend's big-eared bat — This species was detected in 2000 near Longmire. No actions are proposed that would be likely to disturb potential roosting sites or foraging. Therefore, alternative 1 would not affect this species.

Chinook salmon, Coho salmon, bull trout, and coastal cutthroat trout — This alternative is not likely to adversely affect any of these fish species.

- Small numbers of federally threatened Chinook salmon (Puget Sound population) are likely to occur and spawn in several park drainages, including the Carbon, White, Mowich, and Puyallup Rivers. In the past, Chinook salmon were documented in the Carbon River just outside the park boundary.
- Coho salmon were historically found in the same drainages. Although no recent sur-

veys have been conducted, it is likely that they are present today in small numbers.

- Bull trout are found in several of the park's rivers and streams, including the White, West Fork, Carbon, and Puyallup Rivers and their tributaries.
- Coastal cutthroat trout have been documented in the park. However, this species may have been introduced on the east side; it was not historically present in park waters.

Under alternative 1, increased visitor activities such as hiking and horseback riding could reduce shoreline vegetation, which would increase sediment levels in the park's rivers, streams, and lakes. Increased sedimentation could adversely affect trout and salmon during spawning (fall and winter after the first rains) and rearing (spring). However, additional sedimentation associated with alternative 1 would have little overall effect on fall spawning habitat because the additional sediment quantities associated with alternative 1 would be small compared to the normal sediment volumes washed down by the first rains of the season. Little additional springtime sedimentation would be expected because park visitation is low in the spring when streams are used for rearing of young.

Red-legged frog, tailed frog, cascades frog, western toad, and California floater — These amphibians and mussel are grouped because they have similar habitat requirements. Like the fish discussed above, the primary concern for alternative 1 is increased sedimentation. The no-action alternative would not be likely to result in adverse effects on these species because the expected increases in sediment loads would be negligible in comparison to natural sediment loads, especially during first rains and snowmelt or flooding.

Larch Mountain salamander and Van Dyke's salamander — This alternative is not likely to

adversely affect these salamanders, which inhabit the park, as follows:

- Larch Mountain salamanders are found in forested or talused environments and have been documented in the park.
- Van Dyke's salamanders are found in a variety of habitats and have been documented in the park in the Nisqually, Carbon, and Mowich drainages and outside the park near Longmire.

Actions taken under this alternative would not affect the species' habitats or populations because no additional forested, talused, or streambank areas would be developed. Increased visitor use is not expected to produce adverse effects because little additional human activity would be expected in the salamander habitats.

Valley silverspot, whulge checkerspot, and Fender's soliperlan stonefly — It is unknown whether the valley silverspot or the whulge checkerspot occur in the park. The stonefly has been identified near Westside Road. These insects would not likely be adversely affected because current management practices to protect these species would be continued under alternative 1. These include identifying their food plants and breeding habitat, conducting surveys for food plants and habitats before any vegetation removal (butterflies) or changes in aquatic habitat (stonefly), and implementing measures to protect food plants and habitat.

State-listed sensitive plant species — Individual plants of the obscure Indian paintbrush and the other state-listed sensitive plant species would be directly impacted if increased visitor use resulted in additional crushing or picking. However, before implementing any action that might cause harm, the National Park Service would conduct surveys and provide mitigation, as described at the beginning of this analysis. Therefore, alternative 1 would not be likely to adversely affect the Indian paintbrush or other sensitive plant species.

**Cumulative Impacts.** Timber cutting on privately owned old-growth forests outside the park is of particular concern because it would continue to result in the loss or fragmentation of habitat for two federally endangered species, the spotted owl and marbled murrelet. Land development and timber harvesting would continue to adversely affect all of the special-status species outside of the park through such mechanisms as habitat loss, habitat degradation (for example, decreased water temperature and flow, and increased turbidity), and increased sedimentation.

Other actions undertaken by the National Park Service within the park, such as replacing bridges or rehabilitating the Stevens Canyon viaduct, could result in some loss of individuals or inconsequential changes to habitat. Because the National Park Service would implement mitigation, these actions would be not likely to adversely affect any special-status species.

When the effects of actions by others and other actions in the park are combined with effects associated with this alternative, the cumulative effect of all of these actions would be likely to adversely affect special-status species, primarily because of the impacts of logging and land development outside the park. Alternative 1 would not contribute to this cumulative effect.

**Conclusion.** Continued human use, along with the expected increases in visitor use in the park, would cause disturbance to individuals of special-status species. However, the survey, avoidance, and mitigation actions that would be taken by the National Park Service would ensure that alternative 1 would not adversely affect any species of federal or state status.

The effects of actions by others and other actions in the park, when combined with the effect of actions under this alternative, would be likely to adversely affect special-status species. Alternative 1 would not contribute to this cumulative effect.

## IMPACTS RELATED TO GEOLOGIC HAZARDS

**Analysis.** Adverse impacts under alternative 1 would range from major to negligible. Development sites within the park that are currently in volcanic and nonvolcanic hazard areas would remain in their current locations. No actions under this alternative would result in facilities being built in or removed from high-hazard areas. Therefore, all impacts would be associated with increased visitation to park facilities within areas that are subject to geologic hazards.

With the expected slight long-term increases in the number of visitors to the park, more visitors would be exposed to volcanic hazards. Short-term safety hazards would range from negligible to major, although the likelihood that any event would occur within five years or less would be low. However, in the long term (up to 100 years or more), negligible to major long-term safety hazards would continue to exist at these sites because of the potential for injury or loss of life should a geologic event occur. The degree of risk, and therefore the level of impact due to volcanic hazards, would depend on the potential recurrence interval for a debris flow event likely to occur in the respective zone.

Several developed areas of the park (White River campground, Cougar Rock campground, the Longmire area, the Box Canyon picnic area, the Kautz Creek maintenance area, and Ipsut Creek campground) as well as portions of Westside Road (below Dry Creek and at the Puyallup River) are within case III zones. Increased visitor use at these areas would have major adverse impacts because these areas have the highest degree of risk with a recurrence interval estimated at less than 100 years.

Areas within case II zones (the Nisqually, Stevens Canyon, White River, and Carbon River entrances; Sunshine Point campground; and the Falls Creek picnic area) would have

less risk, with a recurrence interval of 100 to 500 years, but still there would be moderate adverse impacts. Areas within case I zones (Tahoma Woods, and Camps Schurman and Muir on the mountain) would have the least degree of risk with a recurrence interval of more than 500 years, with minor adverse impacts.

Areas outside these zones (Paradise, Sunrise, and Mowich Lake) would have a negligible degree of risk for debris flows. However, these areas are close to the mountain and would be hazardous if a volcanic event occurred. In addition, evacuation routes from these areas would cross case II or case III inundation zones. Although visitors would be advised to stay in these locations during some types of volcanic emergencies, the large number of visitors who could be affected by a volcanic event and blocked evacuation routes would constitute a major adverse impact.

Efforts to educate visitors and employees about hazards would better prepare individuals to respond appropriately and to assist in evacuation efforts in the event of a hazard-related emergency. However, education would not eliminate the long-term public safety risks associated with sites in existing hazard zones.

Exposure to nonvolcanic hazards such as avalanches and rock falls would also increase with more visitors in the park. This would result in major adverse impacts at the White River campground, where fractured rock on Little Tahoma peak is perched just above the campground. Major to moderate adverse impacts also would occur along the southern portion of Westside Road (along Tahoma Creek), where several mass movements of rock have been sent into the valley, and in moderate adverse impacts at the Cougar Rock campground due to the proximity of cliffs producing large rocks in accumulated talus.

There would be moderate to minor adverse impacts along portions of the Nisqually to

Paradise road and Stevens Canyon road due to areas of adjacent rockfall terrain, and at Ohanapecosh due to potential failure of weak rocks on the east valley wall. Other developed areas of the park, such as Camp Muir, could be subject to lesser risk of rockfall, constituting a minor adverse impact.

Winter use, including skiing, snowshoeing, snowboarding, and overnight camping, would increase slightly under alternative 1. Park visitors and employees would remain in areas prone to avalanches throughout the park. The park staff would continue current efforts to alert visitors and employees to the potential avalanche hazards. However, there still would be adverse impacts due to risk of avalanches. These would be minor to moderate because, there would be fewer visitors and employees than in summer.

The Ipsut Creek campgrounds, as well as portions of the Longmire area, would be subject to hazards from flooding due to their proximity to the floodplains of the Nisqually and Carbon Rivers. The impact in the Longmire area would be mitigated because of the existence of levees. Facilities at the Carbon River entrance and the Ipsut Creek campground have been subject to flooding in the past. This flooding would continue to pose a hazard. Because of the number of visitors and employees affected and the localized nature of the flooding, it would constitute a minor to moderate adverse impact.

**Cumulative Impacts.** Adverse impacts related to geologic hazards under alternative 1 would range from major to negligible. Impacts related to geologic hazards caused by other actions, either inside or outside the park, would occur only in the close vicinity of those actions. Therefore, no cumulative impacts have been identified because the impacts of alternative 1 would not add to or decrease the impacts from hazards in other locations.

**Conclusion.** As park visitation increases in the future, keeping NPS facilities in hazardous zones would continue to represent major to negligible adverse impacts resulting from risks to visitors and employees. Many developed sites in Mount Rainier National Park are in areas at risk from debris flows that could occur at any time of year, some without warning. The debris flows to which these areas are subject are far more destructive than water-dominated floods. As visitation levels increased, more people would be exposed to the risks of volcanic hazards.

No cumulative impacts have been identified. Impacts related to geologic hazards resulting from this alternative would not increase or decrease the impacts related to other actions inside or outside the park, because impacts would be restricted to areas in the close vicinity of those projects.

## IMPACTS ON CULTURAL RESOURCES

### Archeological Resources

**Analysis.** No adverse effects on archeological resources would result from alternative 1. At present, less than 2% of the total land area in Mount Rainier National Park has been systematically surveyed for archeological resources. As a result of these surveys, 54 archeological sites and 31 isolated finds have been documented. Additional reconnaissance and subsurface testing would be likely to increase the number of recorded sites.

Disturbances can result from construction and maintenance activities and unrestricted visitor access to areas of known sensitivity for archeological resources. Visitor access impacts can include disturbances caused by overflow parking along roadside and trailhead areas, the creation and use of social trails, and occasionally the use and maintenance of existing trails.

Some prehistoric archeological sites are located near areas of high public use and visibility, including Sunrise Ridge, Frozen Lake, and Tipsoo Lake. Several of these have sustained impacts from both natural and human-caused erosion (a consequence of pedestrian traffic on designated and social trails). The increase in visitors anticipated under alternative 1 would continue the human-caused erosion of these sites or other known or unknown prehistoric sites. However, mitigating measures adopted by the park require avoidance and protection of these resources. Therefore, there would be no adverse effect.

The park staff would continue established resource protection measures for the identification and treatment of archeological resources on a case-by-case basis. Where potential impacts were identified, possible mitigation could include, but would not be limited to, avoidance and protection, data recovery (evaluated as an adverse impact that would be undertaken as a last resort), and educational outreach programs such as informative onsite tours and presentations.

**Cumulative Impacts.** Cumulative impacts on archeological resources are considered on a region-wide basis because prehistoric and historic activity in the Mount Rainier region was not limited to the area within the current park boundary.

Actions outside the park include a variety of development projects, public improvements, and timber harvest proposals, including those described in the “Methodologies” section. Because of the large acreage involved and the fact that Native American sites are in the vicinity of Mount Rainier and have been impacted, it is likely that numerous sites would continue to be impacted. If the actions were recently permitted by state or federal agencies, recordation may have been required. However, it is likely that many archeological resources have been destroyed without knowledge, causing an adverse effect.

Examples of other actions in the park that could affect archeological resources include the replacement of bridges and the stabilization and improvement at Camp Muir. These actions would be subject to NPS policies requiring avoidance or mitigation of impacts on archeological resources, and therefore would have no adverse effect.

When other actions that are external to the park are considered, along with this alternative and other actions in the park, the cumulative effect would be major, long-term, and adverse. This would occur because of development outside the park that would impact sites without recordation. However, alternative 1 would not contribute to this adverse effect. In fact, because mitigating measures adopted by the park require avoidance and protection of these resources, this alternative would be expected to preserve archeological resources for the region.

**Conclusion.** Established resource protection measures for the identification and treatment of archeological resources would continue on a case-by-case basis. More visitation, which could result in continuing erosion of some archeological sites, would have no adverse effects because the park’s resource protection measures would continue to be implemented. When other actions that are external to the park are considered, along with this alternative and other actions in the park, there would be a major cumulative adverse effect on archeological resources. However, alternative 1 would not contribute to this adverse effect.

### **Ethnographic Resources**

**Analysis.** No adverse effects on ethnographic resources would result from alternative 1. Ethnographic resources include gathering and ceremonial sites, sometimes referred to as “traditional cultural properties.”

Traditionally, NPS resource protection policies have restricted the traditional procurement of plants by Native American within the park boundaries, thereby limiting tribal access to these ethnographic resources. However, a recent agreement between one federally recognized tribe and the National Park Service at Mount Rainier National Park has partially restored tribal access rights, permitting the procurement of certain plants for religious and cultural purposes. This has benefited the tribe by reestablishing traditional cultural connections with the mountain's resources.

Slight increases in visitor use under the no-action alternative would have no adverse effect on the ability of Native Americans to continue cooperative agreements with the park. Should ethnographic resources be identified in the future, the National Park Service would ensure that efforts were made to avoid or appropriately mitigate impacts on such resources. Tribal preferences regarding the confidentiality and treatment of culturally sensitive resources would be respected. Therefore, there would not be likely to be any adverse effects on ethnographic resources.

**Cumulative Impacts.** Cumulative impacts on ethnographic resources are considered on a regional basis because prehistoric and historic activity in the Mount Rainier region was not limited to the area within the current park boundary. Actions outside the park that could affect ethnographic resources would be the same as those identified for archeological resources. Specific impacts on ethnographic resources due to these actions are unknown. However, it is likely that numerous resource collection and traditional cultural sites have been impacted, and would continue to be adversely affected, because of the large acreages affected by logging and land development, and the high probability that Native American sites occur throughout the Mount Rainier vicinity. If recent actions were permitted by state or federal agencies, data recovery may have been

required. However, it is likely that many ethnographic resources have been destroyed without knowledge, resulting in an adverse effect.

Examples of other actions in the park that could affect ethnographic resources include the replacement of bridges and the stabilization and improvement at Camp Muir. These actions would be subject to NPS policies requiring avoidance or mitigation of impacts on ethnographic resources, and therefore would have no adverse effect.

When other actions that are external to the park are considered, along with this alternative and other actions in the park, the cumulative effect on ethnographic resources would be major, long-term, and adverse. This would occur primarily because of development outside of the park that would impact sites without recordation. The contribution of alternative 1 actions to these cumulative impacts would be negligible. Because efforts would be made to avoid or appropriately mitigate impacts on ethnographic resources, this alternative would be expected to preserve ethnographic resources for the region.

**Conclusion.** Although the park's ethnographic resources are largely unknown, alternative 1 would not affect existing or potential future cooperative agreements between Native Americans and the park, nor would it affect traditional cultural properties. Should ethnographic resources be identified in the future, appropriate mitigation would be implemented to avoid or reduce impacts so that no adverse effects would occur.

The cumulative effects on ethnographic resources would continue to be adverse. However, alternative 1 would not contribute to these adverse effects. Because efforts would be made to avoid or appropriately mitigate impacts on such resources, this alternative would help preserve ethnographic resources for the region.

### **Historic Resources, including the Mount Rainier National Historic Landmark District**

**Analysis.** No adverse effects would result from the implementation of alternative 1. This alternative would not include any major new construction or major changes that would affect historic resources known to contribute to the significance of the National Historic Landmark District. However, impacts on the district would not be fully known until cultural landscape characteristics were identified through cultural landscape inventories and reports. The replacement of the Sunrise Lodge with a ranger/concession facility would be a mitigated adverse impact, as discussed in the *Environmental Assessment: Sunrise Development Concept Plan* (NPS 1992b).

The park staff would continue to implement established resource protection measures for the treatment of historic resources. Treatment measures for historic resources would continue to conform to park guidelines and the *Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties* (36 CFR 68). However, as structures aged and more visitors to the park encountered the historic structures, the potential would exist for increasing impacts.

Conditions that are now known to be inconsistent with the original design of the park would continue. These include the historic vehicular circulation pattern, which helps determine, to a large degree, the sequence and content of the visitor's experience of the park. At Paradise, vehicular circulation would continue to be reversed from its historic, counter-clockwise direction. Continued closure of Westside Road to private vehicles above the Dry Creek area would also be inconsistent with historic visitor circulation and would limit visitors' experiences as defined by the original master plan.

**Cumulative Impacts.** Cumulative impacts on historic resources are considered on a region-wide basis because they would extend beyond

the current park boundary. Actions outside the park that could affect historic resources would be the same as those identified for archeological resources.

It is likely that, based on the large acreage involved and the knowledge of historic sites occurring in the vicinity of Mount Rainier, numerous sites have been impacted and would continue to be impacted. If the actions were recently permitted by state or federal agencies, data recovery may have been required. However, it is likely that many historic resources have been destroyed without knowledge, causing an adverse effect. Although regionwide impacts have had a cumulative adverse effect on historic resources, they have not directly affected the National Historic Landmark District.

Projects visible from the park, such as the expansion of the Crystal Mountain Ski Resort and several timber harvest plans, might diminish the visual integrity of the district for visitors whose viewsheds would include newly developed or logged land. This would have an indirect adverse effect on the district.

Examples of other actions in the park that could affect historic resources include maintaining or replacing historic bridges, replacing the Paradise dormitory, and replacing the Sunrise Lodge. These actions would be subject to NPS policies requiring the avoidance or mitigation of impacts on National Historic Landmark District resources. Separate environmental analysis would occur for actions that were considered adverse effects, as was done for the replacement of the Sunrise Lodge. Therefore, there would be no adverse effect.

When the effects of actions by others and other actions in the park are combined with impacts associated with this alternative, the cumulative impact would be major, long-term, and adverse, primarily because of the effects of logging and land development on historic resources outside the park. Alternative 1 would not contribute to this cumulative adverse

effect. In fact, because the ongoing preservation maintenance of buildings and structures would continue and because cultural landscape analyses would be completed for the district, this alternative would preserve historic resources for the region.

**Conclusion.** No adverse effects from the no-action alternative were identified. Regionwide impacts would continue to have a cumulative adverse effect on historic resources but would not affect the National Historic Landmark District. Alternative 1 would not contribute to the regionwide cumulative adverse effect.

### Henry M. Jackson Memorial Visitor Center

**Analysis.** Under the no-action alternative, the Henry M. Jackson Memorial Visitor Center would be retained in its current condition and function. If the building was determined to be eligible for listing on the National Register of Historic Places as a significant example of the Mission 66 program, the no-action alternative would have no effect on the building's eligibility. However, the continued physical preservation of the building would remain difficult.

**Cumulative Impacts.** Cumulative impacts would not occur because the building would be preserved and there would be no adverse effect.

**Conclusion.** Retaining the Henry M. Jackson Memorial Visitor Center in its current capacity as part of the no-action alternative would have no effect, and no cumulative effect, on the building's potential historical integrity.

### IMPACTS ON THE VISITOR EXPERIENCE

Based upon a continuation of existing trends in visitation, the number of visitors to the park is expected to increase slightly over the long term, with substantial fluctuations from year to year. It is expected that as much as 50% of the

total visitation would occur in July and August, and as much as 75% would occur during the peak-use period (June–October).

The increase in annual visitation would be likely to result in more visitors during peak-use days (sunny weekends and holidays) within the peak period. Many or most of the additional visitors would want to go to the major developed areas, including Longmire, Paradise, Ohanapecosh, and Sunrise, or the popular accessible portions of the wilderness area such as Spray Park, Reflection Lake, and Fryngpan Creek.

Increases in annual visitation could also result in more summer visitor use on off-peak days, including weekdays and days with cloudy weather. More visitation could also occur in the spring and fall shoulder seasons.

The visitor experience would be affected by changes in access to or within the park, the range of activities available and how enjoyable those activities were, the availability of information, and the character of the wilderness experience. The impacts on the visitor experience for each of these four measures are presented in the following sections.

#### Visitor Access

**Analysis.** Alternative 1 would result in major adverse impacts on visitor access during peak periods. These impacts would be caused by delay and inconvenience in finding parking; the long distance of parking from visitor destinations, and vehicular congestion in popular areas.

With the no-action alternative, the overall accessibility of the park to visitors would not change. Specifically, there would not be any changes in

- practices to control or manage visitor access

- the operation or location of the visitor entrances to the park or the major roadways used by visitors to travel within the park
- access to trailheads and minor developed areas
- the amount of parking available
- the current management practices of allowing overflow parking along roadsides

Because the number of visitors at peak periods now causes congestion, any increases in visitation associated with the no-action alternative would increase peak-period congestion, particularly at popular activity areas.

Most visitors would be able to find parking under the existing policy that allows overflow parking. However, at peak periods, the available parking would be quite distant from their destinations. Currently under peak-use conditions, the following percentages of visitors use overflow parking:

Longmire -----	14%
Paradise-----	40%
Ipsut Creek Campground -	50%
Sunrise -----	55%
Mowich Lake-----	72%

During highly congested periods, some visitors choose to pass through an area without stopping. Many of these visitors are deterred from stopping because of the inconvenient parking.

As visitor use increased on peak-use days, the number of days and the length of time during those days with congestion would increase. As a result, more visitors would have to park at inconvenient or remote locations, or might choose to pass through an area. This would increase visitor frustration and detract from the visitor experience.

Trailhead parking would continue to overflow along roads. For example, during peak periods, designated parking at the Fryngpan Creek trailhead is barely adequate to serve existing visitor use, and designated parking at the White River picnic area and trailhead is fully occupied for much of the day. These conditions would get worse under alternative 1.

Visitor surveys have indicated that congestion is the top cause of dissatisfaction with the visitor experience. The perceptions of high numbers of vehicles in parking lots or on the roads also is important in determining the quality of visitors' experiences. Therefore, as visitation increased, this alternative would have a minor adverse impact in the short term and a moderate to major adverse long-term impact on the visitor experience in the peak periods.

At off-peak times in summer, and during the shoulder season (May and November), visitation would continue to be low enough that an increase in visitors would not be likely to cause noticeable congestion, even in the popular visitor areas. (For example, in 1998–1999 the average number of visitors in May was less than 25% of the number in August.) Visitors would be able to drive from one area in the park to another without experiencing congestion and would generally be able to find a parking space near their destination. Therefore, this alternative would have a negligible effect in off-peak periods during the summer and shoulder seasons.

In winter, visitor access would not change under the no-action alternative. Most winter visitors would enter the park through the Nisqually entrance, with Longmire or Paradise as their destination. The park would also be accessible as far as Ohanapecosh from State Route 123. On the western side, visitors would be able to access Carbon River Road and Westside Road near the junction with the Nisqually to Paradise road. Although State Route 410 in the park is not plowed, access for

winter activities would continue to be available at the gate at the park's northern boundary. All these roads would be subject to temporary closures during adverse weather conditions, such as heavy snowfall or downed trees.

Except for weather-related closures at Paradise, or when there is some temporary congestion in the Longmire area, the park roads in winter are not congested, and parking use is less than the available supply, even on peak-use days. During popular winter days (usually sunny weekends and holidays), congestion and heavy use of overflow parking at Longmire would continue on mornings when heavy snow delayed opening of the road. Currently, about 35% of the visitors to Longmire in the winter use overflow parking on peak days. As visitor numbers increased, more visitors would be inconvenienced by the need to use overflow parking.

In winter peak periods, the impacts of implementing the no-action alternative on visitor access in the Longmire area would be moderately adverse. However, at off-peak periods in Longmire, and throughout the winter in other areas, there would be no congestion, parking would be adequate for the number of visitors, and impacts would be negligible.

**Cumulative Impacts.** An unknown, but growing, number of Crystal Mountain Ski Resort visitors are skiing into the park. Development projects in the vicinity of the park, especially the Mount Rainier Resort at Park Junction, the expansion of the Crystal Mountain Ski Resort, and the Train to the Mountain, could bring additional numbers of visitors to the general area. This could increase travel times to the park and visitation in the park. Peak-use periods for these developments probably would correspond to peak periods of visitor use in the park (sunny summer weekends and holidays). Therefore, any increase in park visitation associated with these developments at peak times would have negative effects on visitor access to and within the park.

It has been suggested that some of the planned developments could divert some visitor use from the park, reducing impacts. This is considered unlikely based on the popularity of the park as a regional recreation destination.

In the long term, local planning efforts to manage and control growth and development, such as the *Pierce County Comprehensive Plan* and the *Upper Nisqually Valley Community Plan*, could stabilize visitor use levels and limit the possibility of developing additional large visitor attractions near the park. However, these plans would not diminish the effects of currently planned developments.

When the cumulative effects of actions by others were combined with impacts associated with this alternative, there would be major long-term cumulative adverse impacts on visitor access during peak-use days. In winter and in off-peak periods in summer, visitation would be accommodated by existing parking and circulation facilities, and the cumulative impact would be negligible.

**Conclusion.** Under alternative 1, people visiting the park during off-peak periods would continue to find ready access to areas that offer high-quality recreation experiences. Thus, the alternative would have a negligible effect on visitor access during off-peak periods. However, during peak-use days, alternative 1 would have major adverse impacts on visitor access. Increased traffic congestion and difficulty in finding convenient parking would cause a decrease in the quality of the experience for many visitors, and visitor frustration would increase.

Development projects in the area have the potential to increase the number of visitors during peak periods of park visitation. When combined with the major adverse impacts of alternative 1 on visitor access, there would be major long-term cumulative adverse impacts on visitor access.

## Range and Enjoyment of Visitor Activities

**Analysis.** The existing range of visitor experiences would continue, and the existing management zones in the park would continue to provide for the existing summer and winter activities in both wilderness and nonwilderness areas.

Except in some areas during sunny summer weekends and holidays, park visitors would continue to find opportunities for high-quality recreation activities and experiences as they drive park roads, hike trails, picnic, camp, and use other park facilities. There would be no major new developments that would detract from scenic views under this alternative. At times of peak use, the noise levels would continue to be affected by people and their vehicles, even in some parking areas outside the major activity centers, particularly popular trailheads and picnic areas with high visitor use, but natural sounds would still largely dominate the park as a whole.

Impacts from increasing levels of visitor use would be most pronounced at popular locations in nonwilderness areas, such as Paradise and Longmire, as well as in the wilderness area on sunny summer weekends and holidays. Visitor centers, museums, hiking trails, and picnicking areas would become more crowded. Wait times to talk with rangers or use facilities would also increase, all of which would detract from the quality of the visitor experience.

The intrusion of parked vehicles, particularly along the roadways, as well as the number of vehicles would detract from visitors' enjoyment, particularly at Paradise, where during peak periods overflow roadside parking intrudes on the natural setting of Paradise Valley Road and views of the mountain.

Without rehabilitation, the Henry M. Jackson Memorial Visitor Center would continue to be inaccessible for visitors with disabilities and would not meet current life-safety code

requirements. The inaccessibility for visitors with disabilities and the lack of compliance with life-safety code requirements would continue to have a moderately adverse impact on visitors' experiences over the long term, and if the building were to be closed for an extended period due to unsafe structural conditions, there would be major adverse impacts on the range of activities available.

This alternative would not change the range of visitor activities offered in the winter. With fewer visitors in the winter, and only a modest growth rate expected, most visitors would continue to find opportunities for winter camping and high-quality skiing, snowshoeing, or snowboarding, and thus would have excellent experiences. Noise levels would be dominated by natural sounds, except for the occasional sounds of people and snow removal equipment, which are part of the expected winter environment.

Overall, during peak-use periods there would be more crowding than currently exists as visitor use increases. This would have a minor adverse impact in the short term and, as the number of visitors continued to increase, there would be major adverse, long-term impacts on the enjoyment of visitor activities, particularly in popular areas of the park such as Paradise and Sunrise.

During non-peak times in the more popular areas, and throughout the year outside these areas, the impact of this alternative would be negligible in both the short term and the long term.

**Cumulative Impacts.** Alternative 1 would result in major adverse impacts on visitors' enjoyment of activities during peak periods of visitor use because of congestion and crowding in and around visitor facilities and the intrusion of vehicles in popular activity areas.

As discussed in the above analysis of cumulative impacts on visitor access, Crystal

Mountain Ski Resort visitors are skiing into the park. Development projects in the vicinity of the park could bring additional visitors to the general area, which could in turn increase visitation in the park. It is likely that peak-use periods for these developments would correspond to peak periods of visitor use in the park (that is sunny weekends and holidays).

Therefore, because any increase in park visitation at these times would increase the congestion and crowding in the park, there would be a negative effect on enjoyment of visitor activities in the park. Although these development projects would provide new visitor activities outside the park, potentially redirecting some visitor use away from the park at peak times, they would be unlikely to offset the attraction of the park.

Other past and future projects in the park have had, and would continue to have, minor beneficial effects by improving visitor facilities in the park.

Overall, other projects have the potential to increase the number of visitors to the park during peak periods of visitation with resulting negative effects on congestion and crowding in the park. Combined with the major adverse impacts of alternative 1, there would be major, adverse, long-term, cumulative impacts on enjoyment of visitor activities.

In winter and in off-peak periods during summer, the impacts of the no-action alternative would be negligible, and because other projects within and outside the park (e.g., Crystal Mountain) would have a minor adverse effect on the range or enjoyment of activities in the park, the cumulative impact would also be minor.

**Conclusion.** Under alternative 1, visitors during off-peak periods would continue to enjoy a high-quality recreation experience with the existing range of activities. Thus, alternative 1 would have a negligible effect on the

range and enjoyment of visitor activities during off-peak periods. However, alternative 1 would result in major adverse impacts during peak periods in the long term as increased use levels reduced the enjoyment of park activities and increased visitor frustration due to increased crowding and congestion at visitor centers, at camping and picnicking facilities, and along trails. Visitors' enjoyment of the activities would also be diminished by the intrusion of vehicles, particularly at Paradise and Sunrise.

Overall, other projects have the potential to increase the number of visitors to the park during peak periods of visitation with resulting negative effects on congestion and crowding in the park. Combined with the major adverse impacts of alternative 1, there would be major, adverse, long-term, cumulative impacts on enjoyment of visitor activities.

### **Convenience and Accessibility of Information**

**Analysis.** Under alternative 1, current opportunities for information, orientation, and interpretation would be continued at existing locations. In addition to the facilities in the park (Paradise, Sunrise, Longmire, Ohanapecosh, and White River), the existing visitor contact centers outside the park (Silver Creek, Enumclaw, and Wilkeson) would be retained, and the park wilderness information centers would remain in their current locations.

Visitor information would continue to be available through personal contact, printed material, and on the park's Web site. No new centers for visitor information would be added, and no programs to provide additional signs or other directional information would be undertaken.

Over the long term, increased visitation during peak-use periods would make it more difficult for some visitors to obtain park information. This is important because, according to visitor surveys, the availability of information is one

of the most significant contributors to the level of satisfaction, and the inability to provide adequate information to all visitors seeking it would have a major effect.

Therefore, this alternative would have major adverse impacts on visitors' experiences at peak periods, as visitor levels increased over the long term. During off-peak periods, even with increased visitor levels, visitors would be able to get information in a timely way from current locations and programs, and therefore the impact at off-peak periods would be negligible.

**Cumulative Impacts.** Under alternative 1, there would be major adverse impacts during peak periods of use caused by visitors' difficulties in getting information to plan their visit, finding directions, or talking with someone at a visitor center.

As discussed in the above analysis of cumulative impacts on visitor access, development projects in the vicinity of the park, could bring additional numbers of visitors to the general area, thus increasing visitation in the park at peak times and having negative effects on the ability of visitors to get information. To some extent, these projects could provide expanded information about the region and the park, but because they would not be part of a broader program of information for the park the effects would be limited. Other actions within the park would have no effect on the availability of information.

Overall, other actions have the potential to increase the number of visitors to the park during peak periods of visitation, with resulting negative effects on the ability of visitors to obtain information both in and outside of the park. When these effects are combined with the major adverse impacts of alternative 1, there would be major, adverse, long-term, cumulative impacts on convenience and accessibility of information.

In winter and in off-peak periods during summer, the impacts of the no-action alternative would be negligible, and even with increased visitation generated by the other projects the total visitation could be accommodated by the existing information programs; therefore, the cumulative impact would also be negligible.

**Conclusion.** During off-peak periods this alternative would have a negligible effect on visitors obtaining information. However, increased visitation during peak-use periods would make it more difficult for some visitors to obtain park information. Because the availability of information is one of the most significant contributors to the level of satisfaction with visitors' experiences, this alternative would have major adverse impacts as visitor levels increased over the long term.

Other actions would have the potential to increase the number of visitors to the park during peak periods of visitation with resulting negative effects on the ability of visitors to obtain information. When these effects were combined with the major adverse impacts of alternative 1, there would be major adverse long-term cumulative impacts.

### **Wilderness Values and Experience**

**Analysis.** Under alternative 1 the current management of visitors in wilderness areas would generally continue, and the restrictions on trailside camps, camping, and climbing (e.g., different party size limits in different zones, campsite locations in the cross-country zone), and wilderness standards would not be modified.

Opportunities for Solitude — Even with the expected increase in visitation, there would still be many opportunities for visitors to find outstanding opportunities for solitude, particularly in off-peak periods. In most of the wilderness area visitors would not be likely to

encounter other people or signs of use due to the lack of trails and the rough terrain.

In particular, there probably would be many opportunities for solitude in the lower forests and alpine regions of the park. However, to get to the areas of greatest solitude, hikers and backpackers would continue to have to walk through the highly visited nonwilderness areas. Opportunities for solitude would be low or would decline on weekends and holidays in areas that are within a few miles of major activity centers (i.e., the distance most daytime visitors would venture from Longmire, Paradise, Ohanapecosh, and Sunrise) and in areas near roads with pullouts or trailheads.

There are high use levels at a number of popular day-use areas — including Comet Falls and Van Trump Park, Glacier Basin, Spray Park, Eunice Lake, Tolmie Peak lookout, the Naches loop trail, Snow Lake, Muir snowfield, Summerland, Burroughs Mountain, and Mount Fremont. Visitor surveys in several of these areas indicate that visitors already feel crowded during peak periods. With higher day-use levels, visitor encounters would increase, and fewer people would experience solitude.

The existing permit system should minimize user encounters and maintain opportunities for solitude in the cross-country zones. However, in areas with trailside camps and on the major climbing routes up Mount Rainier, multiple parties would probably continue to be encountered and opportunities to experience solitude would be low. In time, as more climbers found they could not get permits to go up the standard routes, they would be likely to try other more difficult routes up Mount Rainier. If this occurred, opportunities for solitude would also decline on these routes.

Winter visitors would continue to find outstanding opportunities for solitude in the vast majority of wilderness. There would be a greater likelihood of visitors encountering

other people near Paradise, Longmire, and other developed areas on weekends, although the numbers would remain low in winter compared to summer levels. The impact of this alternative on opportunities for solitude in winter would be negligible.

Overall, the opportunities for solitude would be adversely affected by increased numbers of visitors in the wilderness areas, which at peak times would increase the level of crowding at popular locations or create crowded conditions at locations that are currently less used. These effects would have a minor to moderate adverse impact in the short term, and a major adverse impact in the long term as further increases in the number of peak period visitors occurred. In off-peak periods, the lower levels of activity would mean that the opportunities for solitude would not be affected, and the impact of this alternative would be negligible.

Opportunities for Primitive, Unconfined Recreation — Continuing current management practices would not alter opportunities for primitive recreation in the wilderness area, primarily hiking, backpacking, and climbing. Day-use visitors generally would have complete freedom to go wherever they pleased. However, overnight camping permit requirements would continue to affect the freedom of backpackers and climbers to go where and when they wanted in the wilderness area.

Users already are redirected at times on weekends from such popular areas as Comet Falls, Glacier Basin, Spray Park, Mystic Lake, Summerland, and Snow Lake because camps or zones have reached their use limits. With increased applications for permits, fewer people would be able to go to their first choice. Some users would be displaced into other areas in the park; others might go to other areas in the region. In addition, increased numbers of daytime visitors could prevent overnight users from being able to park near desired trailheads on weekends, such as in the Tipsoo Lake, Comet Falls, and Fryingpan Creek areas. This

would force overnight users to go elsewhere, either inside or outside the park. These effects would create minor adverse peak-period impacts in the short term and moderate adverse peak-period impacts in the long term as more potential users would be affected. In addition, some visitors might shift their use of the wilderness area to off-peak periods. As use levels increased in off-peak periods and actions began to be taken to manage this use, there might be a minor adverse impact on opportunities for primitive, unconfined recreation.

**Naturalness** — Under alternative 1 most users would find what they perceive to be “pristine” natural conditions in most of the wilderness area; that is, users would continue to find a landscape generally untrammelled by people, with few signs of disturbance or alteration. In the winter most visitors would continue to perceive the park’s wilderness as a natural snow and ice-covered landscape. In areas where the wilderness is close to roads, signs of people would be more evident. For example, wilderness visitors would continue to be able to see and hear traffic on the road in the Stevens Canyon area.

Signs of human use, including social trails (unplanned, unofficial trails), trampled vegetation, and bare ground from camping, are evident in high use areas, particularly in alpine and subalpine meadows, and affect the naturalness of the visitor experience. Efforts are underway to restore some of these damaged areas, but with use levels expected to increase, it is likely that visitors, despite mitigation efforts, would alter additional areas. In addition, with more climbing parties, there probably would be more litter and human waste on the upper slopes of Mount Rainier.

Although there is not as direct a relationship between increased numbers of users and impacts on naturalness as there is for solitude, it is likely that greater numbers of users would increase the chances for visitors going off-trail and outside of designated camping areas. The

resulting decrease in the perceived naturalness of popular areas would be a moderate adverse impact in the long term.

**Cumulative Impacts.** There are expected to be adverse impacts on wilderness values within the park under the no-action alternative, due to decreased opportunities for solitude and primitive recreation and loss of naturalness in the more popular wilderness areas.

As discussed in the above analysis of the cumulative impacts on visitor access, development projects in the vicinity of the park, including the Mount Rainier Resort at Park Junction, the expansion of the Crystal Mountain Ski Resort, and the Train to the Mountain, could bring more visitors to the general area, and this could increase day and overnight use in the wilderness, which would have a minor to moderate adverse effect on opportunities for solitude and primitive, unconfined recreation.

In addition, if other national forest wilderness areas and national parks in the region should begin proactive visitor management programs (instituting reservation systems or use limits), visitors could be redirected or turned away from a number of wilderness areas in the region at peak times when an increased number of overnight visitors also would have to be redirected at peak times from popular wilderness areas in the park. This would result in minor effects in the short term, but greater effects in the long term.

The expansion of the Crystal Mountain ski area along the eastern boundary of the park would adversely affect the naturalness of the park’s wilderness landscape by increasing noise and views of people, ski lifts, and other facilities on ridgetops adjacent to the park. On the west side of the park, planned timber sales could affect the naturalness of the wilderness in the park through noise from timber operations in areas such as the Tolmie Peak lookout area and Golden Lakes/Sunset Park, which would be a minor short-term impact. Visual

changes in the forest cover probably would be evident from high vantage points in the wilderness where visitors could look down on the lands and see the cuts; these changes would be long-term impacts, evident for many years, constituting moderate to major impacts on the naturalness of the wilderness.

If the use of the Tahoma Trails system in winter became more popular because of the proposed Mount Rainier Resort at Park Junction near the park boundary, solitude could decrease, although probably a small number of users would be affected; this would constitute a minor adverse impact.

Other actions in the park, such as natural and cultural resource studies and resource management actions would be expected to have a negligible to minor beneficial effect on wilderness values by improving the opportunities for primitive recreation and retaining the naturalness of the wilderness.

In summary, when all of the potential actions outside of the park are considered together with the other actions in the park and the expected increase in day use in the park, there would be the potential for minor to major, adverse peak-period cumulative impacts on opportunities for solitude and primitive recreation in the wilderness area.

In off-peak periods, the cumulative impacts on opportunities for solitude and primitive recreation would be negligible because even with increased visitation generated by the projects outside, the wilderness area would be able to accommodate the total visitation.

There would also be minor to major long-term adverse cumulative impacts on the naturalness of the park's wilderness areas, although the alternative's contribution to these impacts would be negligible.

**Conclusion.** In most of the wilderness area during off-peak periods, summer and winter

users would continue to find outstanding opportunities for solitude and for primitive, unconfined recreation in what most people perceive to be a natural, unaltered landscape. As day-user numbers continued to increase in several popular areas, there could be long-term moderate negative impacts on peak-period summer wilderness users and their experiences. These impacts would be concentrated in or near major day-use areas, areas near roads and trailheads, and along the major climbing routes, where opportunities for solitude would be low, particularly on weekends. Some wilderness users would have less freedom to go where and when they wanted to go, and resource impacts resulting from human presence would be more visible, which would adversely affect the naturalness of the wilderness.

In winter there would be negligible impacts on visitors' opportunities to find solitude in the park, to participate in recreational activities, or to appreciate the wilderness' natural values.

External developments and activities (such as the expansion of the Crystal Mountain ski area, logging of private lands, and development of Mount Rainier Resort at Park Junction) would adversely affect the park's wilderness values, through increases in the number of wilderness visitors and alterations to the natural landscape visible from the park. When actions under this alternative were combined with other actions, there would be minor to major adverse cumulative impacts on park wilderness values.

## IMPACTS ON THE SOCIO ECONOMIC ENVIRONMENT

### Regional Context

**Analysis.** The no-action alternative (continue current management) would not result in the construction of new facilities at the park or in increased employment at the park; therefore, there would be no direct impact on the regional economy (the four counties of King, Pierce,

Lewis, and Yakima) under this alternative. However, people would continue to be attracted to the region, in part because of its many recreation resources, including the park itself. Therefore, the attraction of the park would have a modest indirect beneficial effect on the growth of the regional tourism economy. However, in relation to the size of the overall tourism sector in the four-county region (approximately \$5.8 billion in 1995), the overall impact of this alternative in the context of the region would be negligible but beneficial.

**Cumulative Impacts.** The four-county region is expected to grow at a sustained rate during the next 20 years, reaching a total population of over 3.3 million. The projected population growth during that period is approximately 700,000 people, which is equivalent to the 1999 population of Pierce County. The area around the park, particularly within the Upper Nisqually Valley, would be affected by the regional growth.

Development plans, including the Mount Rainier Resort at Park Junction and the Train to the Mountain, could result in more concentrated residential and commercial development near the park, and also stimulate growth in tourism. Similarly, the proposed expansion of the Crystal Mountain ski area and resort could draw visitors to the area, particularly the northeast part of the park.

The effects of growth in the regional context could have both beneficial impacts, such as increased income and employment, and adverse impacts, such as lessened housing affordability and increased traffic congestion.

Other actions within the park would have only a slight effect on increased employment or expenditures in the regional context, and therefore the impact, although beneficial, would be negligible.

Overall, development in the region would be likely to have major adverse and beneficial cumulative socioeconomic effects on the regional economy. Although alternative 1 would have a small beneficial effect on regional tourism, it would not cause changes in trends in regional population or economic growth; therefore, in a regional context this alternative would have a negligible effect on the overall cumulative impact.

**Conclusion.** Any socioeconomic impacts on the region that could be expected under this alternative would be negligible in effect. Although there probably would be major adverse and beneficial cumulative effects on the economy from regional growth, the effect of alternative 1 on this growth would be minimal.

### Gateway Communities

**Analysis.** Under alternative 1 the park would continue to be managed according to current policies and previously approved plans. Gateway communities would continue to experience positive cyclical increases in business related to tourism. The seasonal influx of visitors to the park would also contribute to traffic congestion problems that currently exist. The local tourism industry would depend on and benefit from visitors attracted to the park; and the park would continue to be an important attraction in the area. The overall effects of the park on gateway communities or the regional area would not change substantially under this alternative, although the modest increases in park visitation would be likely to result in modest increases in visitor expenditures in the gateway communities. The park would continue to coordinate efforts with gateway communities case by case. Therefore, this alternative would have a minor beneficial effect.

**Cumulative Impacts.** As a result of increased visitation to the park over the years, business

and residential development has grown along the access corridors. This growth trend has had a positive impact on the local economy, which is expected to continue under this alternative. Other NPS actions in the park have had and would continue to have a beneficial indirect impact on gateway communities by supporting increased visitation.

Other actions outside the park, such as the Mount Rainier Resort at Park Junction, would also be likely to have a minor to moderate beneficial impact on the gateway communities by leading to increases in business in these communities. Recent regional planning initiatives, particularly by Pierce County, could lead to better protection against haphazard development in rural areas adjacent to the western part of the park. These initiatives would also help ensure the long-term health of the local economy while continuing to benefit from increased park visitation. Although the impacts of the no-action alternative itself would be minor, when combined with these other planning and development actions, there would be a moderately beneficial cumulative effect on the gateway communities.

**Conclusion.** The no-action alternative would result in a minor beneficial effect on the socio-economic environment of the gateway communities. When combined with other planning and development actions in the area, this alternative would be moderately beneficial for the gateway communities.

### **Regional Recreational Opportunities**

**Analysis.** Tourists and recreational visitors tend to choose from a finite set of resources available to them given their budget, time, and preferences about the type of experience they want. Clearly, there is some competition among the various regional recreational resources for an individual's time and other resources that can be allotted to outdoor recreation. Mount Rainier National Park

probably is perceived as one of the few recreation resources in the immediate region that offer an alpine and subalpine wilderness, old-growth forests, panoramic vistas, and abundant glaciers. This perception accounts for some of the park's popularity.

Alternative 1 would not be likely to cause any changes in regional recreational use patterns during either the summer or winter. No major new facilities or activities would be added to those already available in the park, and no major actions would be taken that would attract more visitors or redirect any substantial number of visitors to other recreational facilities. The competitive situation would not be changed, and people would continue to base their selections of outdoor recreational opportunities on their own desires, perceptions, and availability of time and other resources. Therefore, the no-action alternative would have a negligible impact on regional recreational opportunities.

**Cumulative Impact.** Neither alternative 1 nor other NPS actions in the park would add any new recreational opportunities in the region. However, the completion of several proposed recreation projects, including the Train to the Mountain and the expansion of the Crystal Mountain ski area and resort, would increase the local job base as well as the number of recreation visitors to the region. Together with the improvements in national forest recreation areas in the region, there would be moderate beneficial cumulative impacts on regional recreation opportunities. However, with no major new facilities or management action proposed under alternative 1, the park's contribution to these effects would be negligible.

**Conclusion.** Alternative 1 would not cause any significant change in regional recreational opportunities; therefore, it would have a negligible effect. There would be moderate beneficial cumulative impacts on regional recreation opportunities from new develop-

ments outside the park; however, the contribution of alternative 1 to these beneficial impacts would be negligible.

### **Concessions**

**Analysis.** Alternative 1 would not result in major changes in management policies, plans, or actions. Concession contractors and other business permit holders would continue to experience positive, albeit small and seasonal, increases of business activity associated with normal tourism-related growth, resulting in a negligible beneficial effect.

**Cumulative Impacts.** Alternative 1 would result in minor beneficial effects. Other actions in the park would have negligible beneficial effects; they would not be likely to increase the number of visitors or opportunities for concessioners. Recreation-related development in the vicinity of the park, such as Crystal Mountain and Mount Rainier Resort at Park Junction, could generate additional business for the concessioners. This, in conjunction with the normal tourism-related growth at the park, would have a minor beneficial cumulative effect; however, the contribution of other actions to this beneficial effect would be greater than that of alternative 1.

**Conclusion.** The socioeconomic impacts on concessioners and other commercial businesses operating within the park would be positive but negligible under the no-action alternative. Considering the positive effect on overall recreational activity of other developments in the vicinity of the park, the cumulative effects would be minor and beneficial.

### **IMPACTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL**

Private vehicles would continue to be the primary means of transportation to and through

the park. Additional energy requirements (gasoline consumption and fuel for heating and lighting visitor facilities,) would be expected only as a direct result of increased visitation to the park. The Henry M. Jackson Memorial Visitor Center would continue to require an excessive amount of energy for heating, cooling, and the roof snow-melting system.

### **UNAVOIDABLE ADVERSE IMPACTS**

Unavoidable adverse impacts are defined as impacts that cannot be fully mitigated or avoided. Minor adverse impacts on natural resources would occur in some areas throughout the park due to human use. Minor to major adverse impacts would result from the exposure of visitors and employees to nonvolcanic hazards. There would be major adverse impacts on visitors' experience of the park from crowding and congestion in wilderness and nonwilderness areas at times of peak use. Although all these impacts would be unavoidable (short of not allowing any increased human use), mitigation to reduce them would be carried out where possible.

### **IRRETRIEVABLE OR IRREVERSIBLE COMMITMENTS OF RESOURCES**

Under alternative 1 the additional energy requirements identified above would result in an irreversible commitment of resources. There would be no permanent effects on park resources.

### **RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

Under alternative 1 the vast majority of the park would be protected in a natural state and would maintain its long-term productivity — only a small percentage of the park would be converted to development. No new actions

## ENVIRONMENTAL CONSEQUENCES

would be taken to manage visitor use. With increasing visitor use expected, there would be minor impacts on natural resources in the park, with moderate impacts on soils and vegetation in some high use areas. Adverse impacts on the

park's waters, soils, and vegetation, if not mitigated, could reduce the productivity of the park's natural resources in localized areas over time.

## ALTERNATIVE 2: PREFERRED ALTERNATIVE

### IMPACTS ON NATURAL RESOURCES

#### Air Quality

**Analysis.** Compared to the no-action alternative, the preferred alternative would result in a minor long-term beneficial effect on air quality. Both alternatives would have emissions associated with private motor vehicles; however, the shuttle service and the use of new management zones and a carrying capacity framework in this alternative would result in fewer air emissions compared to alternative 1.

Alternative 2 would provide visitor shuttle services at popular visitor areas such as Paradise, along with actions to increase public education and awareness of the air quality issues in the park. These actions would decrease the vehicle miles traveled within the park slightly compared to alternative 1, resulting in a minor beneficial effect.

Several measures would be taken in the preferred alternative to reduce air pollutant emission sources within the park, such as establishing non-burn days and limiting campfires. These actions would have a moderate, beneficial effect in localized areas, and a minor beneficial effect on the park's overall air quality.

The application of the new management zones and carrying capacity framework under the preferred alternative would establish resource protection standards, including standards for air quality. These standards would serve as clearly defined triggers for implementing management actions to reduce air emissions when standards were exceeded and would provide a more systematic approach than would occur under the no-action alternative. This would produce a minor beneficial effect.

Temporary adverse effects on air quality would result from the preferred alternative's in-park construction projects, including the new visitor center at Paradise; and new parking, picnic, and camping facilities in various locations; minor roadway improvements on Westside Road. Emissions would include increased dust and particulate matter in the vicinity of the construction sites and exhaust emissions from construction equipment and vehicles. If visitor welcome centers need to be built outside the park, this activity would have similar effects. At all sites, construction emissions would be localized and would be mitigated to the extent possible. As a result, these adverse impacts on air quality would be short-term and minor.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the effects of actions by others and other actions in the park were combined with the impacts of actions under this alternative, all these actions would result in a minor long-term adverse cumulative impact on air quality. The cumulative air quality impact on visibility would be adverse and minor to moderate.

This alternative's contribution to these adverse cumulative, impacts would be minor, and the region would benefit incrementally from the long-term beneficial effects on air quality from implementing shuttle services and a carrying capacity framework to reduce pollutants from vehicles and campfires.

**Conclusion.** Compared to alternative 1, the preferred alternative would have a minor long-term beneficial effect on local air quality. As in alternative 1, long-term adverse impacts would result from vehicular exhaust emissions and carbon monoxide, volatile organic compounds, and other pollutants from campfires. In addi-

tion, localized, short-term adverse impacts would result from dust and vehicle emissions generated by the preferred alternative's construction activities. However, this alternative would cause a minor beneficial effect on the park's air quality because of the shuttle service, measures taken to manage campfires and reduce other air pollution sources within the park, and the carrying capacity framework.

There would be minor adverse cumulative impacts on air quality, and minor to moderate adverse cumulative impacts on regional visibility. This alternative's contribution to these adverse cumulative impacts would be long term and minor.

### **Water Resources and Water Quality**

**Analysis.** Compared to the no-action alternative (continue current management), the preferred alternative would have minor to moderate beneficial effects on water resources and water quality. Although both alternatives would result in similar small increases in pollutants associated with slight increases in visitation, alternative 2 would include management actions to reduce pollutant loadings and improve the management of stormwater from a variety of sources in the park.

The application of the new management zones and carrying capacity framework under alternative 2 would establish resource protection standards, including standards for water quality. These standards would serve as clearly defined triggers for implementing management action to reduce or eliminate impacts, and would provide a more systematic approach than would occur under the no-action alternative. For example, if a standard for turbidity was exceeded in a zone where fish-rearing was occurring, management actions that could be taken include more intensive visitor education, increased ranger patrols, and better signs. Because implementing the carrying capacity framework would reduce or elimi-

nate the minor adverse impacts that would occur under the no-action alternative, alternative 2 would have a minor beneficial effect.

The proposed boundary adjustment near the Carbon River entrance would place about 1,063 additional acres of forest land under the protection of the National Park Service. This would result in a moderate beneficial effect because it would eliminate the potential for logging, which could cause additional pollutants to enter the Carbon River, as well as causing vegetation removal and substantial soil erosion, which would cause a detectable increase in sedimentation.

As in alternative 1, the increased use of unpaved roads would make them more susceptible to surface erosion and runoff, and vehicle use along roads and in parking lots would continue to deposit petroleum products that would be washed into adjacent waters. However, establishing a shuttle service along the Mowich Lake road under alternative 2 would reduce the number of vehicles on this road, producing a minor beneficial effect compared to the no-action alternative.

Dust and sediment runoff entering Mowich Lake from traffic on Mowich Lake road would be eliminated under alternative 2, which would ban private motor vehicles from driving the last 0.5 mile of the road to the lake and eliminate parking at the lake. Revegetating the existing parking area, along with reconfiguring the Mowich Lake campground, would reduce the amount of sediment entering the lake. The resulting reduction in sediment and the improvement in the lake's clarity would be a minor beneficial effect.

Westside Road and Carbon River Road are subject to flood inundation and repeatedly need repairs, which cause sedimentation of adjacent water bodies. Under alternative 2, if a large portion of either road was lost during major flooding, that road might be closed to

vehicular traffic. This would produce a minor beneficial effect by eliminating dust and sedimentation from vehicular traffic and road repairs.

Physical modifications designed to keep visitors on trails would be made in nonwilderness areas, and overflow parking would be eliminated. These changes would improve the water quality in localized areas by reducing soil disturbance, the loss of vegetation, and the volume and intensity of surface runoff. The result would be a minor beneficial effect.

Removing maintenance and employee housing facilities from the Carbon River entrance and installing picnic sites could allow some of this area to be revegetated, which would decrease the potential for surface erosion and runoff. This would produce a minor beneficial impact on water quality. The use of best management practices would ensure that the short-term adverse water quality impacts associated with runoff during the removal process were negligible.

All construction activities associated with alternative 2, including replacement of the Henry M. Jackson Memorial Visitor Center, would have short-term, minor to negligible, adverse impacts. There would be no net increase in impervious area as a result of new construction in the park, and water quality effects during construction would be mitigated by the use of best management practices.

Reconfigured facilities, including the parking area at Paradise, would be designed to minimize long-term effects on water quality through the use of permeable surfaces and vegetated or natural filters or traps for filtering stormwater runoff. Other best management practices for runoff control, such as sediment ponds, oil/sediment separators, street sweeping, and infiltration beds (soil capture of surface pollutants) could also be used. These measures would decrease pollutant loading in runoff and reduce the volume and intensity of

runoff compared to the no-action alternative. This would result in a minor long-term beneficial effect on water resources and water quality.

New visitor facilities, including facilities outside the park and in the boundary adjustment area, would be constructed with the same types of surface water control features that were identified for the reconfigured facilities. In the boundary adjustment area, new facilities would be constructed only in areas that had already been disturbed, and all other previously disturbed areas would be revegetated. These measures, combined with the small areas involved, would ensure that the long-term impacts were negligible.

Because winter visitor use in the park is low and future increase in visitation would be slight, winter use under this alternative would have few impacts compared to the no-action alternative. However, the formally adopted snow-depth requirements for wilderness camping would have a minor beneficial effect by ensuring that the snow depth was adequate to protect against soil disturbance and loss of protective vegetative cover.

Plowing Mowich Lake Road to the Paul Peak trailhead and developing a sno-park at the trailhead would increase vehicle-related pollution affecting water quality and water quality problems associated with the improper disposal of human waste. Although there would be an adverse impact, it would be negligible to minor because of the low use levels and visitor education strategies to reduce the impact.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. The effects of actions by others and other actions in the park when combined with impacts associated with this alternative would result in moderate to major long-term adverse cumulative impacts on

water resources and water quality in the region, primarily because of the effects of logging and land development outside the park.

This alternative's contribution to the cumulative impacts would be minor because this alternative would contribute very little to pollutant loading of regional waterways. Under this alternative, the carrying capacity framework and other actions, including the elimination of potential logging in the proposed boundary adjustment area, would provide an incremental benefit to the region's water quality.

**Conclusion.** This alternative would result in long-term minor to moderate beneficial effects. Some of the contributing factors would be as follows:

- the reduction of sedimentation and pollutants resulting from implementing the carrying capacity framework and new management zones
- reductions of sedimentation and pollutants associated with traffic through the establishment of shuttle services
- improved protection of Mowich Lake
- the removal of existing facilities at the Carbon River entrance and revegetation of part of the area
- long-term protection of the vegetation in the boundary adjustment area
- the design of new and reconfigured facilities to control surface water flows and pollutants
- improved protection of nonwilderness trails
- elimination of overflow parking along roadway shoulders

Minor short-term adverse impacts on localized areas would result from construction projects under alternative 2. Preserving undisturbed

land in the boundary adjustment area would have a moderate beneficial effect.

There would be major to moderate long-term adverse cumulative impacts primarily due to pollutant loads in runoff associated with logging and land development outside the park. This alternative's effects on these adverse cumulative impacts would be short term and minor. In fact, this alternative would have a long-term beneficial effect on regional water quality by reducing pollutants and sedimentation in the park.

### **Floodplains**

**Analysis.** The preferred alternative would have moderate long-term beneficial effects on floodplains. In all the following aspects, alternative 2 floodplain effects would be identical to those of alternative 1.

- No new developments would occur in regulatory floodplains.
- Continued levee maintenance and stream-bank protection at Longmire and Sunshine Point campground, along with the operation of the Ipsut Creek campground, would have moderate to minor long-term adverse impacts on floodplain values.
- Ongoing repair of minor flood damage along Westside Road and Carbon River Road would have moderate long-term adverse impacts on floodplain values.

Under alternative 2, if a large portion of either Westside Road or Carbon River Road was damaged by glacial outburst or precipitation flooding, the roads might be closed to personal motor vehicles. Compared to alternative 1, closing either road to vehicular traffic would result in moderate long-term beneficial effects as natural river processes were restored. At the Carbon River entrance, the removal of housing and the ranger station would have a minor

beneficial effect because these facilities are within the 100-year regulatory floodplain.

**Cumulative Impacts.** When the effects of actions by others and other actions in the park were combined with impacts associated with this alternative, there would be moderate long-term adverse cumulative impacts on floodplains in the region. These would be due primarily to the effects of maintaining logging roads on private and public lands outside the park. This alternative's contribution to cumulative impacts would also be moderate and adverse, due to continued maintenance of levees and manipulation of streambanks along several sections of floodplains in the park. However, if the Carbon River or Westside Road was closed, there would be a moderate beneficial contribution due to the restoration of natural floodplain processes in the park.

**Conclusion.** Alternative 2 could have moderate long-term beneficial effects on floodplain values in several sections of floodplains in the park. These effects would result if, after major flood damage occurred, either Westside Road or Carbon River was closed and natural river processes were reestablished. Cumulative effects would include moderate long-term adverse impacts on floodplains in the region because of actions outside of the park. This alternative's contribution to these cumulative impacts would also be moderate, although if Carbon River or Westside Road was closed, the alternative's contribution would be beneficial and moderate.

## Wetlands

**Analysis.** There would be no impacts on wetlands under this alternative. No actions are proposed under the alternative that would directly affect wetlands, and existing practices that prevent indirect impacts on wetland areas would continue.

**Cumulative Impacts.** Wetlands on both public and private lands in the vicinity of the park have been extensively modified by logging and developments. Past NPS actions also have modified wetlands within the park. Although long-term effects on wetlands must be mitigated through wetland restoration or the creation of replacement wetlands under the Clean Water Act, there still has been a moderate adverse long-term cumulative impact on wetlands in the region. Alternative 2 would not contribute to this cumulative impact.

**Conclusion.** There would be no impact on wetlands under this alternative. Although there would be a moderate, adverse, long-term, cumulative impact on wetlands in the region, the preferred alternative would not contribute to this impact.

## Soils and Vegetation

**Analysis.** Compared to the no-action alternative (continue current management), the preferred alternative would have moderate to minor long-term beneficial effects on soils and vegetation. Although both alternatives would result in similar small increases in adverse effects associated with slight increases in visitation, alternative 2 would include several management actions to reduce or eliminate some of the adverse effects that would occur under alternative 1. In addition, it would extend protection by the National Park Service to about 1,063 more acres, an area that contains a mosaic of mature and mid-successional forest and riparian habitat.

The application of the new management zones and carrying capacity framework under alternative 2 would establish resource protection standards, including standards for protection of soils and vegetation. These standards would serve as clearly defined triggers for implementing management actions to reduce or eliminate impacts, and would provide a more systematic approach than would occur under

the no-action alternative. This approach would reduce or eliminate many of the effects on soils and vegetation that were described for alternative 1 and would produce long-term, beneficial effects ranging from minor to moderate.

The proposed boundary adjustment near the Carbon River entrance would place about 1,063 additional acres of forested land under National Park Service protection. This would result in a minor to moderate long-term beneficial effect because it would eliminate the potential for logging, which could result in vegetation removal and soil erosion on U.S. Forest Service and private lands if not included as part of the boundary expansion. Vegetation removal and soil compaction would occur on that portion of the land that was developed with a new campground and picnic area and where administrative facilities were relocated from the Carbon River entrance. However, this action would be limited to previously disturbed areas and would represent a minor adverse impact.

As in alternative 1, increased visitor use would result in ongoing invasion by exotic (nonnative) species. Because alternative 2 would limit the use of pack stock to just two trails, the introduction of invasive plants from animal feed, pack equipment, and the animals themselves would be eliminated along other trails in the park. This would be a minor long-term beneficial effect.

Opening the Westside Road to shuttles could result in new exotic plant infestations. Preventive measures such as keeping shuttles and administrative vehicles clean of exotic species plant parts and seeds would reduce this impact. However, preventive management actions would not eliminate the potential for the introduction and spread of nonnative species along the roadside, and there would likely be a minor adverse impact on native species.

Under alternative 2, most construction or rehabilitation projects would occur in areas already disturbed by human use. New facilities would be placed in minimally sensitive areas. Therefore, little additional loss of vegetation would occur. The new visitor center at Paradise would not result in additional loss of undisturbed vegetation, because the new center would be constructed within the existing developed area (parking lot).

As was described in the “Alternatives” chapter, the new welcome centers outside the park would be housed in existing structures if possible. However, if new buildings were necessary, construction activities would have short-term minor adverse effects on soils and vegetation. Depending on whether or not facilities were built on previously disturbed sites, the long-term adverse effects would range from negligible to minor.

Beneficial effects on soils and vegetation would result from all of the following actions undertaken as part of alternative 2. Because these impacts would affect relatively small areas within the park, their impacts would be negligible to minor.

- Removing maintenance and employee housing facilities near the Carbon River entrance and installing picnic sites could allow part of this area to be revegetated and restored.
- The application of resource indicators and standards would enable park staff to detect impacts at earlier stages and would allow for more efficient and economical restoration and mitigation actions.
- Reducing vehicle traffic through the introduction of shuttle services would reduce the amount of dust and other pollutants affecting vegetation.
- Eliminating overflow parking would reduce impacts on roadside vegetation.

- Restricting most winter activities to areas where the snow was deep enough to protect the underlying vegetation would result in less loss of vegetation and less soil erosion.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative.

This alternative's contribution to the adverse cumulative impacts would be minor and primarily short term. However, preserving vegetation and preventing soil erosion in the park under the carrying capacity framework, as well as protecting forests in the boundary adjustment area, would produce an incremental benefit to the protection of soils and vegetation in the region.

When the cumulative effects of actions by others and other actions in the park were combined with impacts associated with this alternative, there would be minor to major, long-term, adverse cumulative impacts on soils and vegetation in the region, primarily because of the edge effects of logging and land development on vegetation and soils.

**Conclusion.** This alternative would result in long-term minor to moderate beneficial effects on soils and vegetation. Some of the contributing factors would include better protection of resources through the implementation of the carrying capacity framework and new management zones, the protection of about 1,063 additional acres along the Carbon River as a new part of the park, and the restoration of developed areas near the Carbon River entrance.

Minor short-term adverse impacts on localized areas would result from construction projects under alternative 2. Although there would be minor to major long-term adverse cumulative impacts on vegetation and soils in the region, primarily due to logging and land development, the alternative's contribution to these adverse cumulative impacts would be minor.

By preserving vegetation and preventing soil erosion in the park, the alternative would have an incremental beneficial impact.

## Wildlife

**Analysis.** Compared to the no-action alternative (continue current management), the preferred alternative would result in a minor to moderate long-term beneficial effect on wildlife. Although both alternatives would have similar small increases in adverse effects associated with slight increases in visitation, alternative 2 would include several management actions to improve conditions compared to those that would occur under alternative 1. In addition, alternative 2 would extend protection by the National Park Service to about 1,063 additional acres of wildlife habitat.

The application of the new management zones and carrying capacity framework under alternative 2 would establish resource protection standards, including standards for preservation of wildlife habitat. These standards would serve as clearly defined triggers for implementing management action to reduce or eliminate impacts and would provide a more systematic approach than would occur under the no-action alternative (continue current management). For example, by minimizing disturbance from human activity, the zones and carrying capacity framework could help maintain local wildlife populations, thereby constituting a moderate beneficial impact.

The proposed boundary adjustment near the Carbon River entrance would place about 1,063 more acres of forested land under the protection of the National Park Service. This action would eliminate the potential for wildlife habitat loss due to the logging of private and U.S. Forest Service lands in the area, resulting in a minor to moderate long-term beneficial effect.

Construction activities under alternative 2 could have minor short-term adverse effects on wildlife. In the park, these effects would be associated with the construction of a new visitor center at Paradise; additional parking picnic, and camping facilities in various locations; minor roadway improvements on Westside Road; and minor modifications to nonwilderness trails. If welcome centers had to be built outside the park, there would be similar minor short-term adverse effects on wildlife.

Most development would occur in areas already disturbed by human use. Therefore, no additional loss of habitat would be expected, and adverse effects would be limited to the short-term construction impacts described above.

As in all the alternatives, with increased use of the park there would be a higher potential for road kills, particularly in areas with short sight distances and/or at dusk and dawn when light conditions are poor. Wildlife such as deer and elk would be particularly susceptible to collisions. Although some animals would be injured or killed, the number of collisions would not be expected to increase dramatically. Low posted speeds also would help reduce mortality. Thus, road kills resulting from alternative 2 would have a minor impact on wildlife populations in the park.

Opening Westside Road to motorized shuttles and adding picnic sites under alternative 2 would facilitate access and encourage more visitors to use this area. Increased human activity could increase wildlife disturbances. However, these adverse impacts would be negligible to minor because the road is already accessible for hiking and biking.

Operating shuttles on the Westside Road would have the potential for several other impacts on wildlife. As noted above, there would be the potential for vehicle-wildlife collisions resulting in road kills. Depending on the kind of shuttles used, noise from the ve-

hicles could disturb wildlife near the road, startling some animals, possibly causing some individuals to move away from the road. However, shuttles would not be expected to run frequently on the road, and any impacts would likely be negligible to minor to the wildlife populations in the area.

If the Westside Road was closed after a major washout, local effects would return to current levels. Similarly, if the Carbon River Road was closed, there would be a minor beneficial effect on wildlife from the reduction in vehicular and human activity along the road.

The removal of housing and maintenance facilities from the Carbon River entrance could adversely affect bats if they use the buildings for roosting. Therefore, site surveys would be conducted prior to building removal. If bats were found to inhabit the buildings, mitigating measures would include providing replacement roost areas, and the effects would be negligible. The restoration of vegetation in association with installing picnic sites after building removal could provide additional wildlife habitat. This long-term beneficial effect would be negligible to minor because of the small area involved and the continued human activity in the area.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the effects of actions by others and other actions in the park were combined with impacts associated with this alternative, there would be minor to major long-term adverse cumulative impacts on wildlife in the region, primarily because of the effects of logging and land development outside the park.

This alternative's contribution to the adverse cumulative impacts would be minor and primarily short term. However, preserving wildlife habitat in the park under the carrying capacity framework and eliminating potential

impacts on habitat in the boundary adjustment area would result in an incremental benefit to wildlife in the region.

**Conclusion.** This alternative would result in long-term minor to moderate beneficial effects on wildlife. Some of the contributing factors would be protecting resources better through implementing the carrying capacity framework and new management zones, protecting about 1,063 additional acres of wildlife habitat along the Carbon River as a new part of the park, and restoring vegetation in the Carbon River entrance area. Minor short-term adverse impacts on localized areas would result from construction projects and from opening Westside Road to shuttles under alternative 2.

Cumulative effects would include minor to major long-term adverse impacts, primarily due to habitat loss associated with logging and land development outside the park. This alternative's contribution to these adverse cumulative impacts would be minor, and by preserving wildlife habitat in the park, the alternative would have an incremental beneficial effect.

### Special Status Species

**Analysis.** Alternative 2 would be not likely to have adverse effects on any special status species. However, some inconsequential changes to habitat or loss of individuals might occur, as described below.

The preferred alternative would include the same survey, avoidance, and mitigation provisions that were described in the analysis for the no-action alternative (continue current management). In addition, the carrying capacity framework and new management zones under this alternative would include resource protection standards to protect habitat for special status species. These standards would clearly define triggers for implementing management action to reduce or eliminate effects on special-

status species habitat, and they would provide a more systematic approach than would occur under alternative 1. Taking management actions to avoid disturbance from human activity would have a beneficial effect on the preservation of habitat for special status species.

The impact analysis is arranged by groups of species with similar habitat requirements. For most species, the effects under the preferred alternative would be essentially the same as for alternative 1. The analysis presents only those effects that would be different from the no-action alternative (continue current management).

The preferred alternative would not be likely to affect any of the following special-status species. The bases for these conclusions would be identical to those described under the no-action alternative (continue current management):

- bald eagle
- peregrine falcon
- ferruginous hawk
- Larch Mountain salamander
- Van Dyke's salamander
- valley silverspot
- whulge checkerspot
- Fender's soliperlan stonefly
- state-listed sensitive plant species

Marbled murrelet, northern spotted owl, and northern goshawk — The preferred alternative would not be likely to adversely affect these species. The carrying capacity framework and new management zones associated with this alternative would improve the protection habitat for these species by establishing triggers to ensure that visitor uses and management actions did not adversely affect critical habitat. If monitoring indicated potential concerns, management actions such as closures would be implemented to protect these species.

The introduction of shuttle services along Mowich Lake road would increase summer

visitor use in these areas. However, human use would be localized, and the potential area of effect would be small. Therefore, these actions would not be likely to adversely affect these species.

Offering shuttles along the Westside road would not be likely to adversely affect northern spotted owls, marbled murrelets, or northern goshawks. Although shuttles would increase the number of visitors who would have easier access to areas along the Westside Road, such use would occur over the broad area covered by the road, and the resulting effects (noise and disturbance) would be localized and of short duration. Although northern spotted owls could be hit by vehicles, resulting in death or injury, the probability of this occurring would be small because the shuttles would travel at slow speeds and intermittently, primarily during summer daylight hours (avoiding sensitive dawn and dusk periods). Thus, opening the Westside Road to shuttles might affect, but would not be likely to adversely affect, these three species. Additional environmental analysis would be carried out when the park's transportation plan was developed and more details of the shuttle operation were known to confirm this finding and determine whether additional mitigation measures would be needed.

Minor construction would be carried out in areas of northern spotted owl or marbled murrelet habitat. This would include improvements to Westside Road for shuttle access, construction of picnic areas at the Carbon River entrance, and the modifications in the Mowich Lake area and along Westside Road. To avoid disturbing nesting birds, construction near nest sites would be restricted during the breeding season. During other seasons, construction-related noises and activities could displace or disturb individual birds, but the effects would be temporary and localized.

Employee housing and maintenance facilities at the Carbon River entrance would be removed and replaced with picnic sites for visitors. These activities would not be likely to displace owls,

murrelets, or goshawks because the small, localized disturbance would be in a previously impacted site.

The boundary adjustment area adjacent to the Carbon River entrance includes land designated as critical habitat for marbled murrelets. This action would protect marbled murrelets and other special-species inhabiting about 1,063 acres from logging or other major development on U.S. Forest Service and private lands, resulting in a beneficial long-term effect. All improvements in this area, including administration facilities and a new campground and picnic area, would be placed within currently developed lands and would not be likely to adversely affect murrelets.

In winter the Mowich Lake Road would be plowed to the Paul Peak trailhead, and a snow-park would be designated. Although this would increase winter activity in the area, it would not be likely to have additional effects on northern spotted owls because the road is already used for winter activities, and no nesting is known to occur in the area. In addition, species that are sensitive to human disturbance are already discouraged from using this area by an existing off-road vehicle area adjacent to the park boundary, which is heavily used during the winter.

Olive-sided flycatcher — The preferred alternative would not be likely to adversely affect this species. Most effects would be identical to those described for the no-action alternative (continue current management). However, the preferred alternative would include increased accessibility to some developed activity areas due to road openings and shuttle services and the construction of additional picnic and other visitor facilities. Although these actions would result in higher levels of localized human noise and activity, most changes would occur close to existing developed areas and would have little effect on the montane meadows and subalpine parklands that are the prime habitat for this species. The protection of these areas could be improved

under the alternative 2 prescriptive management zones.

Canada lynx, gray wolf, grizzly bear, California wolverine, and pacific fisher — The preferred alternative would be not likely to affect any of these species. Most effects, including effects on the potential future reestablishment of these species, would be identical to the no-action alternative (continue current management).

- Operating summer shuttles on Westside Road would not increase habitat fragmentation because the road already is used by people and has been open to vehicles for more than 50 years.
- Increased summer visitor use on Carbon River and Mowich Lake roads would not result in increased fragmentation of habitat. Opening part of Mowich Lake road in winter would not affect habitat continuity because winter use in this area would continue to be low.

Long-eared myotis, long-legged myotis and Pacific Townsend's big-eared bat — This alternative would not be likely to result in adverse effects on these species. The effects would be the same as for alternative 1, except that removal of the maintenance and housing facilities at the Carbon River entrance and the construction of additional picnic facilities in the western part of the park could remove some roosting sites. These represent only a small portion of the available roosting sites in the park, and their loss would be mitigated by surveys and other activities, potentially including the construction of new roosting sites.

Chinook salmon, Coho salmon, bull trout, and coastal cutthroat trout — This alternative would not be likely to cause adverse effects on any of these fish species. Under alternative 2, if visitors impacted riparian areas, indicators and standards would result in management actions that would protect streambanks.

Construction activities (including the removal of maintenance and employee housing facilities from the Carbon River entrance), minor improvements to Westside Road for shuttle service, and construction of new picnic areas in the western part of the park could cause construction-related sedimentation. However, best management practices to control sedimentation would be employed, and the construction would be localized and temporary and would affect only short lengths of streambank. Therefore, construction would produce only minor short-term adverse effects on special status fish.

Red-legged frog, tailed frog, cascades frog, western toad, and California floater — Alternative 2 would not be likely to adversely affect these species and would produce effects similar to those under alternative 1. The alternative 2 management zones that would protect wilderness areas would result in a long-term beneficial effect. Effects from construction would be similar to those described above for the fish species; there would be produce only minor short-term adverse effects. Winter plowing of Mowich Lake Road could delay spring melt-out and delay breeding for frogs along the roadside. The delays would be likely to be within the normal variability of the breeding season and would not produce adverse effects.

**Cumulative Impacts.** Effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the effects of actions by others and other actions in the park were combined with impacts associated with this alternative, the cumulative effect of all of these actions would be likely to be adverse effects on special-status species in the region, with major long-term effects primarily caused by logging and land development outside the park. Alternative 2 would not contribute to these adverse effects.

**Conclusion.** Continued human use, along with the expected increases in visitor use in the park, would cause disturbance to individuals of

special-status species. Opening the Westside Road to shuttles also might affect, but would not be likely to adversely affect, northern spotted owls, marbled murrelets, and northern goshawks. The survey, avoidance, and mitigation actions that the National Park Service would take would ensure that alternative 2 would not adversely affect any species of federal or state status.

When the effects of actions by others and other actions in the park were combined with the effects of this alternative, the cumulative effects of the actions would be likely to adversely affect special-status species in the region. Alternative 2 would not contribute to these adverse effects.

### **IMPACTS RELATED TO GEOLOGIC HAZARDS**

**Analysis.** As under alternative 1, the expected slight, long-term increases in the number of visitors to the park would expose more visitors to volcanic hazards. Short-term safety hazards would range from major to minor, although the likelihood that any event would occur within five years or less would be low. However, in the long term (up to 100 years or more), major to minor safety hazards would continue to exist at these sites because of the potential for injury or loss of life should a geologic event occur.

In comparison to alternative 1, park visitors and employees would receive additional information about the threat of geologic hazards and actions to take in case of specific events. These visitor and employee information sources would increase knowledge about the geologic hazards that exist in the park. Disseminating information would give visitors valuable facts that could reduce injury and loss of life associated with these risks, constituting a minor beneficial impact.

Under alternative 2, shuttle service along Westside Road would improve accessibility to

this area, which is subject to debris flows and, at the southern end, rockfalls. This would expose more people to risks from these events, but the frequency of such events, and therefore the level of impact, would not change. The adverse impacts would remain major to moderate along the southern portion of the road.

Winter use, including skiing, snowshoeing, snowboarding, and overnight camping, would increase slightly compared to alternative 1. The adverse impacts due to risk of avalanches therefore would be slightly higher than would occur with the no-action alternative. However, it would still be within the minor to moderate range because the number of visitors and employees in the winter would be low compared to summer use levels.

Impacts from flooding hazards and debris flows would be reduced in comparison to alternative 1 due to the removal of administrative and maintenance facilities from the Carbon River entrance. This would result in a minor beneficial impact.

Most new visitor facilities under this alternative, including picnic areas in the western portion of the park and the new visitor center at Paradise, would not be located in debris flow zones or areas subject to nonvolcanic hazards. Therefore, there would be no impact from the construction of these facilities. However, there would be a minor adverse impact due to the new picnic sites at the Carbon River entrance, which would expose visitors to potential flooding hazards and debris flows.

**Cumulative Impacts.** The impacts of alternative 2 would not add to or decrease the impacts from hazards in other locations. Therefore, no cumulative impacts have been identified.

**Conclusion.** Major to negligible long-term impacts due to volcanic and nonvolcanic hazards would continue under alternative 2, presenting risks to visitor and employee safety.

However, compared to alternative 1, the preferred alternative would result in a slight reduction of risk from volcanic hazards by providing better information. Although both alternatives would have similar increases in risk associated with slight increases in visitation, alternative 2 would result in a minor beneficial effect from the removal of the administrative and maintenance facilities from the Carbon River entrance area, which is subject to debris flows.

On the other hand, alternative 2 would have a minor adverse impact due to the new picnic sites at the Carbon River entrance, which would expose visitors to potential flooding hazards and debris flows. The exposure of visitors to nonvolcanic hazards would increase slightly compared to alternative 1 as measures to increase winter visitation and the Westside Road shuttle would expose more visitors to risks of avalanches, debris flows, and rockfalls. Compared to the no-action alternative, improved information could reduce injury and loss of life when a geologic event occurred.

No cumulative impacts have been identified. Impacts related to geologic hazards resulting from this alternative would not increase or decrease the impacts related to other actions inside or outside the park.

## IMPACTS ON CULTURAL RESOURCES

### Archeological Resources

**Analysis.** Like alternative 1, alternative 2 would result in small increases in human-caused erosion of archeological resources due to increases in visitation.

No direct impacts on known archeological resources would occur under alternative 2. However, undertakings involving ground disturbance for new construction could affect unknown archeological resources. If such resources were identified during ground-

disturbing activities, the park staff would implement appropriate measures to avoid or otherwise mitigate resource impacts in accordance with Section 106 (National Historic Preservation Act) procedures and other applicable cultural resource guidelines and regulations, such as the Archeological Resources Protection Act. If avoidance was not feasible at a location, there could be an adverse effect on archeological resources from construction under alternative 2.

Erosion of archeological resources is often associated with the creation and use of social trails. Compared to the no-action alternative, this situation would be improved under alternative 2, which would include additional measures to keep visitors on designated trails. The preferred alternative also would eliminate overflow parking, which is a key contributor to social trail creation as visitors walk cross-country from where they parked to a developed area. These measures would assist the National Park Service in meeting site protection objectives.

**Cumulative Impacts.** Other actions outside the park and other actions in the park would be the same as those described for alternative 1. When these actions were considered along with this alternative, there would continue to be a major long-term adverse cumulative effect on archeological resources in the region. This would occur because of development outside the park that would impact sites without recordation. The contribution of alternative 2 to this adverse effect would be small, and because mitigating measures adopted by the park would require the avoidance and protection of these resources, this alternative would be expected to preserve archeological resources for the region.

**Conclusion.** As with alternative 1, visitor increases associated with the preferred alternative would have no adverse effects because the park's resource protection measures would continue to be implemented.

Construction activities would be expected to have minor to negligible impacts on archeological resources, although there could be an adverse effect on unknown resources. Regionally, there would continue to be a major cumulative adverse effect on archeological resources. However, the contribution of alternative 2 to this adverse effect would be small in comparison to other actions.

### **Ethnographic Resources**

**Analysis.** Alternative 2 would have the same absence of adverse effects on ethnographic resources that was described for alternative 1. Should ethnographic resources be identified, the National Park Service would ensure that efforts were made to avoid or appropriately mitigate impacts on such resources. Tribal preferences regarding the confidentiality and treatment of culturally sensitive resources would be respected.

**Cumulative Impacts.** Cumulative impacts on ethnographic resources are the same as those described for alternative 1. It is likely that numerous resource collection and traditional cultural sites have been impacted, and would continue to be adversely affected, primarily by actions outside of the park. The contribution of alternative 2 to these cumulative impacts would be negligible. Because efforts would be made to avoid or appropriately mitigate impacts on ethnographic resources in the park, this alternative would be expected to preserve ethnographic resources for the region.

**Conclusion.** Although the park's ethnographic resources are largely unknown, alternative 2 would not have any adverse effects on the ability of Native Americans to procure plants within the park or on known traditional cultural properties. The preferred alternative also would not contribute to cumulative adverse effects on known ethnographic resources that are occur throughout the region.

### **Historic Resources, including the Mount Rainier National Historic Landmark District**

**Analysis.** Compared to the no-action alternative, no adverse effects were identified as a result of alternative 2. Although both alternatives would have the same effects from similar, small increases in visitation, the preferred alternative would have beneficial effects from actions that would help reestablish the historic roadside character of the district and reduce effects on visual character.

The replacement of the Sunrise Lodge with a ranger/concession facility would be the same mitigated adverse impact as noted in alternative 1.

Minor construction proposed under alternative 2 within the National Historic Landmark District would include changing vehicular circulation, eliminating overflow parking, new parking, and improved picnic areas and campgrounds. Some of these construction projects would include reconfiguring the upper Paradise and Ohanapecosh parking areas and constructing more picnic sites at Mowich Lake, Ricksecker Point, and Sunrise. In association with each action, the park would continue to implement established resource protection measures for the treatment of historic resources. Treatment measures for historic resources would conform to park guidelines and the *Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties* (36 CFR 68).

Cultural landscape reports would also be prepared to guide the design compatibility of the proposed changes. As a result, the construction associated with alternative 2 would have no adverse effect on historic resources, including the Mount Rainier National Historic Landmark District.

Reversing the direction traffic drives on the Paradise Valley Road on a trial basis would

have no adverse effects and would result in a beneficial effect on the National Historic Landmark District. This traffic pattern would help restore the historic sense of arrival and spatial sequence that visitors originally experienced as they approached the area.

Eliminating overflow parking areas in the National Historic Landmark District would have a beneficial effect by reestablishing the historic roadside character of the district relative to the contributing characteristics of spatial organization and vegetation. Visitors taking shuttles would be able to experience areas via historic approach routes. These actions would have no adverse effect on the National Historic Landmark District.

Prohibiting private vehicles on Westside Road would continue to affect historic circulation because the road was formerly accessible to private vehicles during the period of significance for the National Historic Landmark District. Opening the road to shuttle traffic would provide a measure of continuity with historic use patterns, lessening the effect. Closing the last 0.5 mile of Mowich Lake Road would affect historic circulation, which would have a minor effect but not constitute an adverse effect. It also should be noted that both of these changes are reversible.

In the event of a major washout, both Carbon River Road and Westside Road might be closed to motorized traffic. However, the historic road corridors would be maintained. Therefore, these actions would not have an adverse effect on the National Historic Landmark District.

Prohibiting pack stock on historic trails such as the Wonderland Trail and Northern Loop Trail would be inconsistent with the period of significance for the National Historic Landmark District. The use of pack stock is a historic use of these trails, which give park staff and visitors better access to the park. This change affects only one aspect of the integrity

of the trail (land use), however, and it would not cause an adverse effect. This change would also be reversible.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the cumulative effects of actions by others and other actions in the park were combined with impacts associated with this alternative, the cumulative impact would be major, long-term, and adverse, primarily because of the effects of logging and land development on historic resources outside the park. Alternative 2 would not contribute to this cumulative adverse effect. In fact, because the preservation maintenance of buildings and structures would continue and portions of the historic circulation pattern and roadside character of the park would be restored, this alternative would preserve historic resources for the region.

**Conclusion.** No adverse effects from alternative 2 were identified. Benefits to historic resources, including the Mount Rainier National Historic Landmark District, would result from such actions as reversing the traffic flow on Paradise Valley Road and eliminating overflow parking within the district. Region-wide impacts would continue to have an adverse cumulative effect on historic resources, but the preferred alternative would not contribute to the cumulative adverse effect.

### **Henry M. Jackson Memorial Visitor Center**

**Analysis.** Under alternative 2, the existing Henry M. Jackson Memorial Visitor Center would be demolished and replaced with a new, smaller visitor center designed to be compatible with the historic character of the National Historic Landmark District. The existing visitor center is adjacent to but not within the National Historic Landmark District. The new, smaller visitor center might be relocated to a site within the district.

The Henry M. Jackson Memorial Visitor Center could be eligible for listing on the

National Register of Historic Places as a significant example of the Mission 66 program. Therefore, the National Park Service would request concurrence with its determination of eligibility for the building by the state historic preservation officer (SHPO).

If the visitor center was determined to be eligible for listing, the National Park Service would mitigate the adverse effect of the removal of the structure by developing a memorandum of agreement with the SHPO to provide documentation of the structure before its removal. Typically, this would include in-depth historic documentation in addition to appropriate photo documentation carried out in accordance with the standards of the Historic American Buildings Survey. As a result, the adverse effect of building removal would be mitigated.

**Cumulative Impacts.** If the Henry M. Jackson Memorial Visitor Center was found eligible for listing, mitigation would be undertaken before the building was removed. No other actions would affect the building. Therefore, no adverse effects and no cumulative impacts would occur under this alternative.

**Conclusion.** Removing the Henry M. Jackson Memorial Visitor Center under this alternative would have no adverse effect, and no cumulative effect on the building because the effects of removal would be mitigated.

## IMPACTS ON THE VISITOR EXPERIENCE

The preferred alternative would have the same slight increases in visitation that would occur under the no-action alternative (continue current management). However, alternative 2 would include several management actions to reduce or eliminate some of the adverse effects that would occur under alternative 1. The effects of these actions on visitor access, the range of activities available and how enjoyable

those activities were, the availability of information, and the character of the wilderness experience are described below.

### Visitor Access

**Analysis.** Compared to the no-action alternative (continue current management), the preferred alternative would have moderate beneficial impacts on visitor access at times of peak use. This would result primarily from decreased traffic congestion and less difficulty in finding convenient parking at major developed areas.

The preferred alternative would eliminate all overflow parking, and parking would be allowed only in designated spaces at visitor centers, trailheads, viewpoints, and other visitor facilities. To minimize the potential adverse effects on visitor access, elimination of overflow parking would be implemented in phases and would not occur until the shuttle services were operational.

During the summer peak-use period, shuttle service would be provided to Longmire, Paradise, Sunrise, White River campground, Mowich Lake, and the Westside and Carbon River Roads. Winter shuttle service also would be provided to Longmire and Paradise. Coordination of shuttle services with the elimination of overflow parking would ensure that an effective visitor transportation system would be available and that visitors would have an alternate means of access to the park's popular destinations.

The National Park Service would use media outlets and its own education and information resources to inform park users of the change. Visitors would have improved access to information for planning their visit to the park at new visitor contact centers on major roads leading to the park. Electronic signs or other communication technologies would provide real-time information on locations where parking was available. Therefore, visitors

would be able to plan and schedule their activities more effectively, and they would be able to avoid areas where parking was filled to capacity or use the shuttle service.

In spite of the above actions, during peak-use periods some visitors would not be able to park at popular locations outside the major developed areas. These would include some trailheads or smaller developed areas such as Narada Falls and Tipsoo Lake, where there would be no alternate means of access.

As in the no-action alternative, at off-peak times during the summer, during the shoulder season (May and November), and in winter, visitation under this alternative would continue to be low enough that a slight increase in visitors would not be likely to cause noticeable congestion even in most popular visitor areas — visitors generally would be able to find a parking space near their destination. However, if heavy snow delayed opening the road to Paradise in winter peak periods, congestion would worsen in the Longmire area because of the elimination of overflow parking and increases in visitation. There would be a short-term moderate adverse impact on visitor access to the Longmire area at these times.

For visitors reluctant to use the shuttle, there could be adverse effects on visitor access. These visitors could choose to visit areas in the park with less use, take a scenic drivethrough the park, or travel to other destinations outside the park. Any adverse impacts would be minor and limited to times of peak use.

There could initially be short-term minor adverse impacts at peak-use periods from a lack of visitor familiarity with the new parking regulations, shuttle services, and information programs. However, as visitors became familiar with the management actions, fewer visitors would be inconvenienced.

Proposed actions in the Carbon River area would have both positive and adverse impacts.

Providing shuttle service would enable some visitors to visit this area who might not otherwise come, and it would help reduce congestion at the end of the road, a minor to moderate positive effect. On the other hand, eliminating overflow parking at Ipsut Creek would have a minor adverse impact because some visitors would not want to take a shuttle and could not find a parking place; such visitors would be displaced to other areas. However, if the road was closed due to a major washout, this would result in a moderate to major adverse impact on visitor access.

In the Mowich Lake area, requiring people to walk half a mile to the lake might reduce the number of visitors who would walk past the lake. The reduction in parking by eliminating overflow parking and the reluctance of some people to take shuttles would prevent access to this area for some people. Some families with children, the elderly, people with disabilities, and picnickers also might not be able to reach the lake. Thus, the alternative would have a minor adverse effect on an unknown number of visitors. On the other hand, with no vehicle congestion at the lake and fewer people using the area, people who did walk to the lake would have a better experience than under the no-action alternative.

This alternative would include providing shuttle service along Westside Road to Klapatche Point, which would improve visitor access to areas north of the existing road closure. This would result in a moderate beneficial effect on visitor access by opening an area of the park now available to relatively few people. The shuttle would provide more convenient access to trailheads and other recreational activities, including new picnic sites at Tahoma Vista, Round Pass/Marine memorial, and Klapatche Point. However, if a major washout occurred, the operation of the shuttle service would be reexamined. Curtailment of the shuttle service would be an adverse impact which, depending on the popularity for the shuttle, could be minor to major.

In the short term, visitor access would be disrupted during the construction of redesigned parking area and new visitor center at Paradise. This would be a minor short-term adverse impact.

Alternative 2 would have little effect on visitor access during off-peak summer days, during the shoulder season (May and November), and in winter. During all these times, there would continue to be few problems associated with visitor access.

**Cumulative Impacts.** Under alternative 2, there would be long-term moderate beneficial effects on visitor access in the park, as well as short-term and long-term minor adverse impacts.

The effects of other actions in the vicinity of the park would be similar to alternative 1 in that they could increase visitation in the park at peak times while also diverting some use from the park and stabilizing visitor use in the long term. Any increase in park visitation at peak times would have a negative impact on visitor access within the park because the increase in visitors would occur at times when the park would already be operating near capacity.

Other past and future projects in the park have had, and would continue to have no effects on visitor access, other than temporary minor adverse impacts during construction.

Overall, the currently planned development projects could increase the number of visitors during peak periods of park visitation. However, when combined with the generally beneficial effects of alternative 2 on visitor access, the cumulative impacts on visitor access would be moderate and beneficial due to reductions in congestion and inconvenience at major visitor areas in the park.

In winter and in off-peak periods in summer, the impacts of the preferred alternative would be negligible (with the exception of Longmire

when there were heavy snowfalls), and even with increased visitation generated by the other projects, the total visitation would be accommodated by existing parking and circulation facilities. Therefore, the cumulative impact on access would also be negligible.

**Conclusion.** Alternative 2 generally would result in moderate beneficial effects on visitor access at times of peak use, which would be due to decreases in traffic congestion and less difficulty in finding convenient parking at major developed areas.

Establishing a shuttle system for visitors and providing improved information about access and parking would largely mitigate any adverse effects from eliminating overflow parking. However, there could be minor short-term adverse effects from an initial lack of visitor familiarity with these measures, and there could be long-term adverse effects because some visitors would still be inconvenienced by eliminating overflow parking.

Moderate long-term beneficial effects would result from increased accessibility in the West-side Road area, and there would be minor to moderate beneficial effects from providing a shuttle on the Carbon River Road. However, there also would be adverse impacts in the Carbon River area from eliminating overflow parking at the Ipsut Creek campground. If the Carbon River Road was closed by a future washout, the magnitude of the impact would increase to a moderate to major long-term adverse impact.

Overall, actions outside the park would have the potential to increase the number of visitors during peak periods of park visitation. However, when these actions were combined with the impacts of alternative 2 on visitor access, there would be moderate beneficial, cumulative impacts on visitor access due to reductions in congestion and inconvenience at major visitor areas in the park.

## Range and Enjoyment of Visitor Activities

**Analysis.** Implementing a carrying capacity framework based upon the new wilderness and nonwilderness management zones proposed under this alternative, along with other actions to improve the enjoyment of visitor activities, would result in major beneficial effects on the visitor experience. Overall, park visitors' opportunities for high-quality recreational activities and experiences would be improved as they drove park roads, hiked trails, picnicked, camped, and used other park facilities because the park would be managed to maintain the quality of park resources and visitor experience.

The new zones show how different areas of the park could be managed to achieve desired visitor experiences and resource conditions, and they describe appropriate kinds of activities and developments. These new zones also provide a framework for managing overnight use and day-use levels in a more systematic way than the zones currently used, based on visitor experience and resource protection indicators and standards. The indicators would be monitored to determine the conditions of resources and visitor experiences, providing information to implement management action if visitor experience conditions were out of standard or deteriorating. For example, if in monitoring indicators it was found that the quality of the visitor experience in the Tipsoo Lake area was declining, actions would be taken to improve the conditions, such as offering visitors more information about how to protect fragile resources, improving the definition of trails, or redirecting visitors so that these impacts could be mitigated or reversed. Continued monitoring would enable additional actions to be taken if necessary.

Removing the picnic area at Falls Creek would have a minor adverse effect on visitors who wanted to use this area. However, visitors would be able to find other opportunities to picnic in the Carbon River area.

Under this alternative, pack stock use would be prohibited (except along the Pacific Crest Trail and connecting trails at the eastern edge of the park). There are few pack stock users, and this would have a minor adverse impact.

The proposed boundary adjustment would eliminate hunting in the acreage added to the park, which result in a minor adverse impact on a few people who hunt on these lands. However, they still would be able to hunt in the much larger expanse of Forest Service and Plum Creek lands.

If the Carbon River Road was closed to private vehicles by a major washout, so that people could no longer drive or take a shuttle to this popular area, one of the few year-round hiking areas in the park would no longer be a desired attraction for many people. Most visitors would not be willing or be able to walk or ride horses or bicycles to the end of the road and would be displaced to other areas in or outside the park. This would be a moderate to major long-term adverse impact on visitors' opportunities to enjoy the park.

With the elimination of overflow parking, visitors parking at popular areas such as Paradise and Sunrise would spend less time on peak-use days walking to and from remote parking areas or searching for a parking place, resulting in more time being available for primary activities. Those taking shuttles would be able to reach these areas without worrying about finding a convenient parking place, and if some form of interpretation was provided on the shuttles, they would be able to learn about the park and its resources.

Eliminating overflow parking also would improve the views along park roadways and lessen the intrusion of vehicles, which now adversely affects the enjoyment of activities at the park.

Other actions that would contribute to the beneficial effects of this alternative, are as follows:

- Visitors would have an opportunity to enjoy the scenery along Westside Road while riding the shuttle, and new picnic areas would be provided at Tahoma Vista, Round Pass/Marine Memorial and Klappatche Point. The visitor experience would be more social in nature, with more visitors in the area, and although a few hikers or bikers might be disturbed by the increased activity, most visitors would be likely to enjoy the experience.
- Similarly, visitors would have an opportunity to enjoy the scenery along the Carbon River Road as they rode the shuttle. The experience would be more social in nature than at present.
- Replacing the Henry M. Jackson Memorial Visitor Center would enhance visitors' enjoyment and appreciation of the park. The new visitor center would be fully accessible for people with disabilities, meet all current building codes, and be a model of energy efficiency. Integrated interpretive exhibits would focus on Paradise area vegetation and geologic processes, giving visitors an understanding and appreciation of the area. Replacing the visitor center also would enable visitors to better appreciate the natural landscape and the cultural resources of the National Historic Landmark District
- Reversing the traffic flow on the Paradise Valley Road on a trial basis would give visitors a dramatic and historic access to Paradise with spectacular views of Mount Rainier apparent when entering the parking lot.
- A new drive-in campground and picnic area would be constructed within the

boundary adjustment area west of the Carbon River entrance.

- New picnic sites would be constructed or sites added at several other locations, increasing the number of visitors who could enjoy picnicking.

Most of the new developments or other actions would not detract from scenic views under this alternative. At peak periods, noise from people and their vehicles would continue to affect visitors' experiences, even outside the major activity centers, particularly at popular trailheads and picnic areas with high visitor use. But natural sounds would still largely dominate the park as a whole.

**Cumulative Impacts.** Under alternative 2, there would be major beneficial effects on visitors' enjoyment of activities.

As discussed in the above analysis of cumulative impacts on visitor access, development projects in the vicinity of the park could bring more visitors to the general area, which could in turn increase visitation in the park at peak times. This would potentially have an adverse effect on visitors' enjoyment of activities in the park. Although these development projects would offer new visitor activities outside the park, potentially redirecting some visitor use away from the park at peak times, they would be unlikely to offset the attraction of the park.

Other past and future projects in the park have had, and would continue to have, minor beneficial effects by improving visitor facilities in the park.

Overall, the effects of other actions, combined with the impacts of alternative 2, would result in major beneficial cumulative impacts on visitors' enjoyment of activities through the implementation of a carrying capacity framework, the new management zones proposed under this alternative, and other actions to improve the quality of visitor facilities.

**Conclusion.** Under alternative 2, as under alternative 1, during off-peak periods visitors could continue to enjoy a high-quality recreation experience with the existing range of activities. However, alternative 2 would have major beneficial effects not only by decreasing congestion and the intrusion of vehicles during peak periods, but also by improving the quality of facilities and, under the carrying capacity framework, maintaining the quality of the park's natural and cultural resource base for the enjoyment of all visitors. On the other hand, if the Carbon River Road was closed by a major washout, there would be a moderate to major long-term adverse impact on visitor experiences in the park.

Overall, other projects outside the park could increase the number of visitors coming to the park during peak periods with potential negative effects on congestion and crowding in the park. However, when combined with the impacts of alternative 2, these projects would result in major beneficial long-term cumulative effects on visitors' enjoyment of activities due to the proposed actions under this alternative.

### **Convenience and Accessibility of Information**

**Analysis.** Under alternative 2, current opportunities for information, orientation, and interpretation would be continued at existing locations. In addition, new information programs and facilities would be available. Interpretive programs at park visitor centers and museums would provide more in-depth and focused interpretation (e.g., interpreting topics relevant to a site). For example, cultural history and river ecology could be emphasized at Longmire, volcanoes and geology at Sunrise, and subalpine and alpine ecology at Paradise. A major rehabilitation or replacement of the audiovisual programs and exhibits would occur in visitor centers and ranger stations within the park and some limited form of interpretation would be provided on shuttles serving visitors.

Several staffed summer visitor welcome centers would be established on corridors leading to the park to provide visitor services, orientation information, and interpretive materials. In addition, media messages, the Internet, and electronic signboards at key locations along the roads would be used to provide visitors with information on parking availability and activities before they arrived at the park.

In the short term, the new programs and facilities would be likely to have a moderate beneficial impact on the visitor experience. In the long term, as the programs become established and visitors become familiar with the locations and services of the new facilities, there would be a major positive impact, particularly because increased visitation, elimination of overflow parking, and implementation of a carrying capacity framework could make access to some popular locations difficult for some visitors.

**Cumulative Impacts.** Alternative 2 would result in long-term beneficial effects.

As discussed in the above analysis of cumulative impacts on visitor access, development projects in the vicinity of the park could bring more visitors to the general area, which could also increase visitation in the park. To some extent, these projects could also provide expanded information about the region and, potentially, the park. With the expanded park information programs under this alternative, it would be possible to better coordinate the overall regional availability of information. Improved access to visitor information would have beneficial effects, particularly if they were incorporated as part of a broader program of information for the park.

When these effects were combined with the major beneficial impacts of alternative 2, there would be major beneficial long-term cumulative effects on convenience and accessibility of information. This impact would be due to

improved park information programs, which would be part of a broader effort to provide expanded information about the region.

**Conclusion.** The quality and availability of information is one of the most important contributors to visitors' satisfaction with their park experiences. Alternative 2 would result in major beneficial effects because visitors could obtain information more easily under this alternative from the greatly expanded information programs and visitor contact facilities.

There would be major beneficial long-term cumulative effects on the convenience and accessibility of information through improved park information programs that would be part of an effort to provide expanded information about the region.

### **Wilderness Values and Experience**

**Analysis.** Under alternative 2, the current management zones would be replaced by new management zones, and a new carrying capacity framework would be implemented. Current trailside camps and camping and climbing restrictions (e.g., different party size limits and campsite locations), generally would continue within the new zones.

Opportunities for Solitude — Under this alternative seven distinct wilderness zones would be applied to the Mount Rainier Wilderness, as opposed to the four zones now in use. The new zones would be expected to have a positive overall effect, ensuring that the existing range of opportunities for solitude would continue into the future. Hikers, backpackers, and climbers would continue to find opportunities for solitude, with few or no encounters with other people, in the pristine and primitive zones (about 92% of the wilderness area). Fewer opportunities for solitude would be encountered in the other wilderness zones (about 8% of the wilderness area), particularly in the high use climbing and

transition zones on weekends. However, encounter levels generally would not change from what they are at present. Existing high use areas generally would continue to be high use areas in the new zones. (And on weekdays and on weekends when the weather was unfavorable, hikers and backpackers also could find opportunities for solitude, even in high use areas, because many people would decide not to go into the wilderness area.) Thus, overall, the application of the new zones should ensure that outstanding opportunities for solitude for both small groups and large groups would continue to be available into the foreseeable future.

In some cases, as the carrying capacity framework was implemented, visitor use might exceed the capacity, resulting in actions to decrease use levels, such as informing visitors about other destinations or instituting reservation systems or lotteries. These actions would thus increase opportunities for solitude in the summer, and from the perspective of users in wilderness area, there would be a positive effect. Use levels also could increase in areas that would be below their carrying capacity, which could decrease the opportunities for solitude in these areas. However, in most cases the permitted increase in use levels would not be expected to substantially increase over current use levels, and people would be spread out on the trails over a given day. In addition, some of these areas are lowland forests, which do not receive much use now and probably would not be popular destinations for most hikers and backpackers. Thus, although use levels might increase, in most areas opportunities for solitude should not change very much from the current situation, and in popular areas opportunities for solitude would improve.

Opening Westside Road to shuttle buses would have both positive and negative effects on solitude. On the one hand, many more people could take a shuttle into this part of the park and hike in the wilderness area, obtaining a

wilderness experience that now is not easily available. On the other hand, with more day-use visitors and overnight backpackers in this area, opportunities for solitude would decline compared to what they are today, particularly within a few of miles of the road.

Under alternative 2 shuttles as well as private vehicles would be permitted on the Carbon River Road. This would result in some people hiking into the wilderness area who might not otherwise do so, at least until there was a major washout and the road was closed. There would be a “pulse effect” when the shuttle’s passengers disembarked at the end of the road, which would adversely affect the opportunities for solitude opportunities along the trail and at the Carbon River Glacier. However, opportunities for solitude would be low along the popular Carbon Glacier trail, regardless of whether or not there were shuttles. The shuttles would not be likely to run frequently or to result in a substantial increase in the number of people going into the wilderness area. Except on weekends and holidays, most of the time there would be relatively few people walking into the wilderness area; therefore, the alternative would have a minor adverse effect on opportunities for solitude in the Carbon River area.

Overall, this alternative would result in a beneficial effect on opportunities for solitude ranging from negligible to minor effects in less popular areas to moderately beneficial impacts in more frequently used areas.

Opportunities for Primitive, Unconfined Recreation — The application of the new zones would have a positive effect, ensuring that visitors would continue to find many opportunities in the wilderness. In most of the wilderness area visitors could walk for miles on trails or cross-country (or ski or snowshoe in winter) and not be hindered. In addition, the Westside Road shuttle would increase people’s opportunities for primitive, unconfined recreation.

However, the application of the zones and carrying capacity framework could increase restrictions on day hikers, backpackers, and climbers going into the wilderness area, affecting their destinations, camping locations, and party sizes.

Current estimated use levels indicate that most wilderness trails may have capacity for additional use, particularly the trails in the Westside Road, Mowich Lake, and Sunrise areas. On the other hand, trails with existing high levels of use, such as those in the Fryingpan Creek, Comet Falls, Reflection Lakes, Snow/Bench Lakes, White River, and upper Spray Park areas, would be much less likely to have additional capacity.

If use levels continued to increase, visitors might be required to attend educational programs or to get permits or reservations. In a few high use areas, if resources were adversely impacted, day-use visitors also might need to obtain permits or might even be redirected from these areas at certain times. Although most visitors would understand the benefits (more opportunities for solitude, fewer signs of people and apparent resource impacts), some might feel that their opportunities for primitive, unconfined recreation had declined compared to the current situation.

If use limits were instituted, this could be mitigated through the expanded information programs and facilities so that visitors would have advance information about high-use areas, be given other options on where to go, and understand the benefits. Some visitors still would be likely to perceive the action negatively, but overall most visitors would gain a positive experience from the quality of opportunities for primitive recreation. Over the long term, as the expanded information programs and facilities became well established and visitors became accustomed to using them, this alternative would be expected to have a moderate to major beneficial effect.

**Naturalness** — The application of the zones and carrying capacities would have a positive effect, ensuring that signs of human impacts (bare ground, trampled vegetation and social trails) would not substantially increase in the future, and in fact would decline in areas. Some high use areas (such as Spray Park, for example) probably still would show signs of human use for many years, but these impacts would be expected to decline in number as park staff restored these areas.

Actions to manage trail use under this alternative, such as more intensive visitor education, increased ranger patrols, signs, or fines for going off-trail, would have a positive effect on maintaining naturalness in the wilderness. In addition, other actions that could be taken to implement the new framework, such as maintaining or restoring natural screening between campsites in the wilderness area, would increase the sense of naturalness. Overall, this alternative would have a long-term moderate beneficial effect on naturalness in the wilderness.

**Cumulative Impacts.** Moderate to major beneficial effects on wilderness values in the park would result from increased opportunities for solitude and primitive recreation and the preservation of naturalness under alternative 2.

As discussed in the above analysis of cumulative impacts on visitor access, development projects in the vicinity of the park could bring additional visitors to the general area. This would be likely to increase day and overnight use in the wilderness, which would have an adverse effect on opportunities for solitude and primitive and unconfined recreation.

If national forest wilderness areas and other national parks in the region started proactive visitor management programs (such as instituting reservation systems or use limits), visitors could be redirected or turned away from a number of wilderness areas in the region at peak times and when more overnight

visitors also were being redirected from popular wilderness areas in the park. This would have minor effects in the short term but would have greater effects in the long term.

As discussed under alternative 1, development along the eastern boundary of the park would adversely affect the naturalness of the park's wilderness landscape by increasing noise and the views of people, ski lifts, and other facilities on ridgetops. On the west side of the park, planned timber sales could affect the naturalness of the wilderness in the park through noise from timber operations in the short term, and in the long term because the timber cuts would continue to be visible from the park. In addition, the increased popularity of the Tahoma Trails system in winter could result in a decrease in solitude, although probably only a small number of users would be affected.

Other actions in the park, such as natural and cultural resource studies and resource management actions, would be expected to have a negligible to minor beneficial effect on wilderness values by improving the opportunities for primitive recreation and maintaining the naturalness of the wilderness.

In summary, when all the potential actions outside of the park were considered together with the other actions in the park and the impacts of the preferred alternative, there would be major to moderate beneficial effects on opportunities for solitude and primitive recreation in the wilderness area due to the effects of the proposed carrying capacity framework and management zones under this alternative.

There also would be minor to major long-term adverse cumulative impacts on the naturalness of the park's wilderness areas, but this alternative's contribution to these impacts would be negligible.

**Conclusion.** Overall, the preferred alternative would have a long-term moderate beneficial impact on wilderness values, with some major

beneficial effects along with some moderate negative impacts due to increased restrictions on wilderness recreation opportunities.

In both summer and winter, opportunities for solitude would be retained in most wilderness areas and improved in some. The alternative would have a positive effect in maintaining opportunities for primitive, unconfined recreation in winter and summer in most of the wilderness area. These opportunities would increase in a few areas, where access was being improved. However, increased restrictions could affect wilderness users, some of whom might feel their freedom was being adversely affected. There would be a positive effect from maintaining the perceived naturalness of the wilderness, with reduced signs of human impacts.

When all of the potential actions outside of the park were considered together with the other actions in the park and the impacts of the preferred alternative, there would be major to moderate beneficial impacts on opportunities for solitude and primitive recreation in the wilderness area due to the effects of the proposed carrying capacity framework and management zones under this alternative.

## IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

### Regional Context

**Analysis.** The preferred alternative would increase employment at the park by 22 employees. Construction activities would have total gross costs of approximately \$47.1 million and would be likely to increase employment, earnings, and taxable sales at the regional level. This represents a relatively modest dollar figure, given the magnitude of the four-county regional economy.

The park would continue to draw tourists to the region, although (as for alternative 1) the

overall effect on the nearly \$6 billion regional tourism expenditure would be small. Under alternative 2, some management and actions could result in modest changes in use patterns for tourism/recreation activities at various locations in and near the park. Establishing a carrying capacity framework and prohibiting overflow parking in the park could result in the redirection of a small number of visitors from the park, particularly in summer. On the other hand, major rehabilitation or replacement of park visitor centers, museums, and other facilities (both inside and outside the park) as well as the provision of new audiovisual programs and exhibits, could attract more people into the region and the park. However, even if redirected from the park, visitors would be likely to stay in the region; therefore, there would be little effect on the overall regional economy.

Overall, in a regional context, the socioeconomic impacts of the preferred alternative probably would be minor but beneficial due to the effects of increases in park employment and construction and the continuing attraction of the park for tourists to the region.

**Cumulative Impacts.** As in alternative 1, this alternative would result in major beneficial and adverse cumulative socioeconomic effects on the region. However, although alternative 2 would have a small beneficial effect on regional tourism and expenditures, it would be unlikely to cause major changes in the trends of regional population or economic growth; therefore, the overall cumulative impacts would be small.

**Conclusion.** Alternative 2 would result in a minor beneficial economic effect from the increases in park employment and construction, as well as the continuing attraction of the park for tourists to the region. However, alternative 2 would have only a small effect on the overall cumulative impacts of regional economic growth.

## Gateway Communities

**Analysis.** As a result of this alternative, visitor use levels would reach capacity in some areas of the park during periods of peak visitor use (due to the elimination of overflow parking); however, the public would be encouraged to visit less crowded parts of the park during the peak-use times or to visit at less crowded times (weekdays or early morning or late afternoon) or use shuttle services. At the same time, developing new facilities outside the park would better serve visitors, particularly if measures were employed (for example, media messages, Internet, and electronic signs along roads to the park) to inform visitors outside the park about whether park activity areas are open or closed.

The prospect of less crowding during off-peak times could encourage visitors to spend more time both in the park and within the gateway communities, which might encourage more tourism expenditures within gateway communities. Nonetheless, some visitors might be discouraged from visiting the park during peak-use days or choose to use other regional recreation resources.

The gateway communities could benefit from new welcome centers and outreach services provided to inform and orient visitors to the park and nearby recreation areas and facilities, such as the Crystal Mountain Ski Area and Resort. It is also possible that new shuttle services would be provided from a site or sites near these communities. The communities would likely experience increases in tourism-related expenditures because more tourists would stop at these locations and nearby areas for information and orientation.

As discussed above in the section on regional context, alternative 2 would result in the expenditure of additional NPS funds within the regional economy. These disbursements would be tied to the development schedules for the various projects and their effect on the gateway communities would depend on where and

when the expenditures occurred. In addition to initial construction outlays, there would be ongoing, long-term expenditures by the park for operational and maintenance costs. These expenditures would contribute to the economies of the gateway communities, as well as to the region's economy. Some local businesses or individuals might receive positive long-term benefits from these expenditures.

Overall, alternative 2 would be expected to have a moderate beneficial impact on the socioeconomic environment of the gateway communities.

**Cumulative Impacts.** Cumulative impacts under alternative 2 would be similar to those of alternative 1. As a result of increased visitation to the park over the years, business and residential development has grown along the access corridors. This has had a moderate beneficial effect on the local economy, which is expected to continue. Other NPS actions in the park have had and would continue to have a minor indirect beneficial effect on gateway communities by supporting increased visitation.

Other actions outside the park, such as the Mount Rainier Resort at Park Junction, would also be likely to have minor to moderate beneficial effects by leading to increases in business in the gateway communities. Recent regional planning initiatives, particularly by Pierce County, could lead to better protection against haphazard development, helping to ensure long-term economic health and continuing to benefit from increased park visitation. The impacts of the alternative, when combined with the other actions, would result in a moderate, beneficial, cumulative impact with respect to the gateway communities. Alternative 2 would contribute substantially to this beneficial impact.

**Conclusion.** Under this alternative, the visitor welcome centers, shuttle staging areas, park construction activities, and increased park

visitation would have a moderate beneficial impact on the socioeconomic environment of the gateway communities. When combined with other planning and development actions in the area, this alternative would also result in a moderately beneficial cumulative impact with respect to the gateway communities.

### **Regional Recreational Opportunities**

**Analysis.** In most cases the preferred alternative would not be expected to cause substantial changes in the recreational use patterns of people in the region during either summer or winter seasons. Replacing the Jackson Visitor Center and providing new audiovisual programs and exhibits in other visitor centers and museums could attract more people to the park. However, implementing a carrying capacity framework at popular activity areas and trails in the park and eliminating overflow parking could result in the redirection of small numbers of visitors, particularly in summer, to other areas outside the park boundary, such as Crystal Mountain. In addition, if the Carbon River Road was closed, visitors would be displaced to other areas in the region, some of which are already heavily used. This would have a minor long-term adverse impact, particularly in winter, because this part of the park is one of the few year-round hiking areas in the region.

On the other hand, even with the additional recreation opportunities at the park, people would continue to make their selections of outdoor recreation based upon their own desires, perceptions, and availability of time and other personal resources. Therefore, it is expected that this alternative would have a minor beneficial impact on regional recreational opportunities.

**Cumulative Impact.** Neither alternative 2 nor other NPS actions in the park would add any major new recreational opportunities in the region, but alternative 2 would result in minor

beneficial effects from improvements in the existing recreational opportunities. Completing several proposed recreation projects, including the Train to the Mountain and the expansion of the Crystal Mountain ski area and resort, would result in an increase in the local job base and increase the number of recreation visitors to the region. Together with the improvements in national forest recreation areas in the region, as well as the additional facilities and activities proposed in the park under this alternative, there would be moderate beneficial cumulative effects on regional recreation opportunities. However, the alternative's contribution to these effects would be minor.

**Conclusion.** Alternative 2 would improve recreation opportunities in the park, but could also result in redirection of visitors to other areas at peak times as the capacity of popular areas is reached. Overall, the alternative would have a minor, beneficial impact. There would be moderate beneficial cumulative impacts, but alternative 2 would not be expected to cause any substantial change in regional recreational opportunities and therefore would have a minor effect.

### **Concessions**

**Analysis.** Under this alternative, eliminating overflow parking and establishing a carrying capacity framework would result in a small decrease in the number of visitors in parts of the park, potentially affecting the business of concessioners that provide lodging, food, or other services. However, this would be offset if visitors either extend their stays in the park or visit the park at off-peak times, and it is likely that there would be a slight increase in the overall number of visitors.

There could be an adverse impact on the business of firewood concessioners if campfire restrictions had to be instituted to protect air quality. However, these restrictions probably would be instituted for short periods or in spe-

cific areas; thus, they should have a minor to moderate long-term impact on concessioners.

This alternative would be unlikely to have adverse impacts on the concessioners or other commercial businesses that provide mountain-eering related services such as guiding. Indeed, the impact might be slightly positive for such operations, because there would be less crowding of facilities, including trails, which would enhance the visitor experience and enjoyment. Overall, the alternative would be expected to have a minor beneficial effect on these businesses.

**Cumulative Impacts.** The effects of alternative 2 on concessions would be similar to those of alternative 1, and the cumulative impacts would also be similar. Other actions in the park would have beneficial but negligible effects, while recreation-related development in the vicinity of the park, such as Crystal Mountain and Mount Rainier Resort at Park Junction, would cause minor beneficial effects. Overall, there would be minor beneficial cumulative effects, to which alternative 2 would contribute.

**Conclusion.** Overall, the socioeconomic impacts on concessioners and other commercial businesses operating within the park would be minor, but beneficial, under alternative 2. The cumulative impacts, considering the positive effect on visitation of other recreation developments in the vicinity of the park, would also be minor and beneficial.

### IMPACTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

There probably would be a gradual reduction in visitor, commuter employee, and concessioner gasoline consumption because of vehicles achieving better fuel economy as newer model vehicles replaced older models

overtime. Establishing shuttle services for visitors and employees on Westside, Carbon River, and Mowich Roads and to Paradise and Sunrise should result in a decrease in fuel consumption throughout the park. In addition, visitors would consume less fuel because they would know in advance when parking was at capacity and would not burn fuel circling and waiting for a parking space. However, the expected increase in overall visitation could increase energy requirements in general, considering that some visitors might travel long distances to visit the park.

Replacing of the Henry M. Jackson Memorial Visitor Center with a new facility would decrease fuel consumption because the building would be designed to be a model of energy efficiency.

### UNAVOIDABLE ADVERSE IMPACTS

This alternative would result in minor adverse impacts on natural resources in some areas throughout the park from human use and the construction of new facilities in the park.

The minor to major adverse impacts identified under alternative 1 from exposing visitors and employees to volcanic and nonvolcanic hazards would continue under this alternative.

This alternative would involve the use of shuttles and the elimination of overflow parking at a number of popular nonwilderness areas in summer. As a result, visitor use at these areas could be reduced below current levels, depending upon the time of week and month of the year. By limiting use, some visitors during the peak summer season might not be able to access the park where they wanted to, when they wanted to, or in the manner they desired. Some visitors might be discouraged from visiting the park or be displaced to less crowded places or times. Visitors who altered their visitation plans would be impacted to a minor to major degree.

Similarly, in the wilderness area, if wilderness use continued to increase, increased management could be required to protect natural resource conditions and the experience of wilderness users. Increased management could result in a loss of freedom for some visitors to visit some wilderness areas during peak-use times.

#### **IRRETRIEVABLE OR IRREVERSIBLE COMMITMENTS OF RESOURCES**

The additional energy requirements identified above would result in an irreversible commitment of resources. In addition there would be commitment of material used for construction of new visitor facilities, such as picnic sites, the replacement for the Henry M. Jackson Memorial Visitor Center, and possibly welcome centers outside the park.

#### **RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

Under this alternative the vast majority of the park would be protected in a natural state and would maintain its long-term productivity.

Only a small percentage of the park would be converted to development. In addition, more than 800 acres of forest land included in the proposed 1,063-acre boundary adjustment area west of the Carbon River entrance would be removed from potential future timber production. There would be no other actions that would jeopardize the long-term productivity of the environment. Short-term impacts associated with construction and restoration might occur, such as localized air and water pollution (see analysis of specific impact topics for detail). Noise and human activity associated with construction and restoration also might displace some wildlife from the immediate area. However, these activities would not jeopardize the long-term productivity of the environment.

## ALTERNATIVE 3: ADDITIONAL VISITOR USE OPPORTUNITIES

### IMPACTS ON NATURAL RESOURCES

#### Air Quality

**Analysis.** Compared to the no-action alternative (continue current management), alternative 3, the additional visitor use opportunities alternative, would have a minor beneficial effect on air quality. Both alternatives would have emissions associated with private motor vehicles. However, the shuttle service, the measures to manage campfires and reduce other air pollutant emission sources within the park, and the use of new management zones and a carrying capacity framework would decrease air emissions compared to alternative 1.

Implementing alternative 3 would produce temporary adverse effects on air quality in association with in-park construction projects, similar to those described for alternative 2. However, these effects would be localized and would be mitigated to the extent possible. As a result, these adverse impacts on air quality would be short-term and minor.

**Cumulative Impacts.** Effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the effects of actions by others and other actions in the park are combined with the impacts of actions under this alternative, the effect of all of these actions would be a minor long-term adverse cumulative impact on air quality. The cumulative air quality impact on visibility would be adverse and minor to moderate.

This alternative's contribution to these adverse cumulative impacts would be minor, and the region would benefit incrementally from the long-term beneficial effects on air quality brought about by the National Park Service's implementing shuttle service and a

carrying capacity framework to reduce pollutants from vehicles and campfires.

**Conclusion.** Compared to alternative 1, alternative 3 would have a minor, long-term, beneficial effect on local air quality. As in alternative 1, long-term adverse impacts would result from vehicular exhaust emissions and particulates, carbon monoxide, and other pollutants from campfires. In addition, localized short-term adverse impacts would result from dust and vehicle emission generated by alternative 3's construction activities. However, a minor beneficial effect on the park's air quality would result from the visitor shuttle services, the measures taken to reduce air pollution sources in the park, and the carrying capacity framework of alternative 3.

There would be minor adverse cumulative impacts on air quality and minor to moderate adverse cumulative impacts on regional visibility. This alternative's contribution to these adverse cumulative impacts would be short-term and minor.

#### Water Resources and Water Quality

**Analysis.** Compared to the no-action alternative (continue current management), alternative 3 would have a minor beneficial impact on water resources and water quality. Although both alternatives would have similar small increases in pollutants associated with slight increases in visitation, alternative 3 would include management actions to reduce pollutant loadings and improve management of storm water from a variety of sources in the park.

Alternative 3 would produce temporary adverse effects on water quality in association with construction projects both within and outside of the park, similar to those described

for alternative 2. However, these effects would be localized and would be mitigated to the extent possible. As a result, these adverse impacts on water resources and water quality would be short-term and minor.

Alternative 3 includes numerous provisions that would improve water resources and water quality, compared to the no-action alternative. These provisions, which were described more fully in the alternative 2 impact analysis, are listed below. Except as noted, all these measures would result in long-term minor beneficial effects.

- new management zones and a carrying capacity framework
- improved protection of the lands in the boundary adjustment area (would have a long-term moderate beneficial effect)
- the introduction of shuttle services, which would decrease pollutant loadings from roads
- the option of closing rather than repairing Westside Road and/or Carbon River Road after a major washout (could have a long-term minor beneficial effect)
- improved trail designs and the elimination of overflow parking
- the removal of some facilities from the Carbon River entrance and the restoration of this area, in conjunction with installing picnic sites
- the design of reconfigured facilities to improve runoff control and pollutant removal

The Henry M. Jackson Memorial Visitor Center would be rehabilitated under this alternative, and the parking lot would be redesigned to increase the number of designated parking spaces. There would be no

net increase in impervious coverage, and adverse water quality impacts during construction would be mitigated to a negligible level. Improved storm water management and pollutant control measures that would be incorporated into the redesign of the area would result in a long-term minor beneficial effect.

To protect the Mowich Lake watershed, the last 0.75 mile of the Mowich Lake road would be paved and the campground would be reconfigured. These actions would have a minor beneficial effect by reducing sedimentation and would improve the clarity of the lake.

Winter use of the park would increase under this alternative, but would still be low compared to summer use. Because of low use levels, winter use under this alternative would have few impacts compared to the no-action alternative. However, the formally adopted snow-depth requirements for wilderness camping would have a negligible beneficial effect by ensuring that the snow depth was adequate to protect against soil disturbance and loss of protective vegetative cover.

Plowing of portions of State Routes 410 and 123 and developing snow-parks would increase vehicle-related pollution affecting water quality and water quality problems associated with the improper disposal of human waste. Although there would be an adverse impact, it would be negligible to minor because of the low use levels, the presence of vault toilets, and visitor education strategies to reduce the impact.

Allowing the use of high-clearance private vehicles on Westside Road in winter could increase surface runoff and sedimentation during spring runoff. This could produce minor localized adverse impacts.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would

be identical to those described for the no-action alternative. The effects of actions by others and other actions in the park, when combined with impacts associated with this alternative, would result in moderate to major long-term adverse cumulative impacts on water resources and water quality in the region, primarily because of the effects of logging and land development outside the park.

This alternative's contribution to the cumulative impacts would be minor because this alternative would contribute very little to pollutant loading of regional waterways. Under this alternative, the carrying capacity framework and other actions, including the elimination of potential logging in the proposed boundary adjustment area, would provide an incremental benefit to the region's water quality.

**Conclusion.** This alternative would result in long-term minor to moderate beneficial effects on water quality. Some of the contributing factors would be

- reductions in sedimentation and pollutants resulting from implementing the carrying capacity framework and new management zones
- reductions of sedimentation and pollutants associated with traffic through the establishment of shuttle services
- improved protection of Mowich Lake
- the removal of existing facilities at the Carbon River entrance and revegetation of part of the area
- long-term protection of the vegetation in the boundary adjustment area
- the design of new and reconfigured facilities to control surface water flows and pollutants
- improved protection of nonwilderness trails

- elimination of overflow parking along roadway shoulders

Minor short-term adverse impacts on localized areas would result from construction projects under alternative 3.

There would be major to moderate long-term adverse cumulative impacts, primarily because of pollutant loads in runoff associated with logging and land development outside the park. This alternative's effects on these adverse cumulative impacts would be short-term and minor. In fact, this alternative would have a long-term beneficial effect on regional water quality by reducing pollutants and sedimentation in the park.

### **Floodplains**

**Analysis.** Compared to the no-action alternative (continue current management), alternative 3 would have moderate, long-term, beneficial effects on floodplains. However, in all of the following aspects, alternative 3 floodplain effects would be identical to those of alternative 1.

- No new developments would occur in regulatory floodplains.
- Continued levee maintenance and stream-bank protection at Longmire and Sunshine Point campground, along with the operation of the Ipsut Creek campground, would have moderate to minor long-term adverse impacts on floodplain values.
- Ongoing repair of minor flood damage along Westside Road and Carbon River Road would have moderate long-term adverse impacts on floodplain values.
- Continued levee maintenance and stream-bank protection at Longmire and the Sunshine Point campground, and operation of

the Ipsut Creek campground would have moderate to minor long-term adverse impacts on floodplain values.

Under alternative 3, if a large portion of either Westside Road or Carbon River Road was damaged by a glacial outburst or precipitation flooding, the roads might be closed to personal motor vehicles. Compared to alternative 1, closing either road to vehicular traffic would result in moderate long-term beneficial effects as natural river processes were restored. At the Carbon River entrance, removing housing and the ranger station would have a minor beneficial effect because these facilities are within the 100-year regulatory floodplain.

**Cumulative Impacts.** When the effects of actions by others and other actions in the park were combined with impacts associated with this alternative, there would be moderate long-term adverse cumulative impacts on floodplains in the region, primarily because of the effects of maintaining logging roads on private and public lands outside the park. This alternative's effect on cumulative impacts, would also be moderate and adverse due to continued maintenance of levees and manipulation of streambanks along several sections of floodplains in the park. However, closing Carbon River or Westside Road would result in a moderate beneficial effect through the restoration of natural floodplain processes in the park.

**Conclusion.** Moderate long-term beneficial effects on floodplain values in several sections of floodplains in the park could result from this alternative. These effects would occur if, after major flood damage occurred, either Westside Road or Carbon River was closed and natural river processes were reestablished. Cumulative effects would include moderate long-term adverse impacts on floodplains in the region because of actions outside the park. This alternative's effect on these cumulative impacts would also be mod-

erate, although if Carbon River or Westside Road was closed, the alternative's contribution would be beneficial and moderate.

## Wetlands

**Analysis.** There would be no long-term impacts on wetlands under this alternative. Construction-related runoff associated with paving the last 0.75 mile of Mowich Lake Road could have short-term minor adverse effects on some wetlands around the lake. However, after construction was completed, the National Park Service would ensure that all wetland areas, functions, and values were fully restored.

No other actions are proposed under alternative 3 that would directly affect wetlands. This alternative would include the continuation of existing practices that prevent indirect impacts on wetland areas.

**Cumulative Impacts.** Wetlands on both public and private lands in the vicinity of the park have been extensively modified due to logging and developments. Past NPS actions also have modified wetlands within the park. Although long-term effects on wetlands must be mitigated through wetland restoration or the creation of replacement wetlands under the Clean Water Act, there has still been a moderate, adverse, long-term, cumulative impact on wetlands in the region. Alternative 3 would provide a negligible contribution to this cumulative impact.

**Conclusion.** There would be no impact on wetlands under this alternative. Although there would be a moderate adverse long-term, cumulative impact on wetlands in the region, alternative 3 would provide a negligible contribution to this impact.

## Soils and Vegetation

**Analysis.** Compared to the no-action alternative (continue current management), alter-

Alternative 3 would have moderate to minor long-term beneficial impacts on soils and vegetation. Although both alternatives would have similar small increases in adverse effects associated with slight increases in visitation, alternative 3 would include several management actions to reduce some of the adverse effects that would occur under alternative 1. In addition, it would extend National Park Service protection to about 1,063 additional acres, which contain a mosaic of mature and mid-successional forest and riparian habitat.

Implementing alternative 3 would result in temporary adverse effects on soils and vegetation in association with construction projects both within and outside of the park, similar to those described for alternative 2. These effects would be localized and would be mitigated to the extent possible. As a result, these adverse impacts on soils and vegetation would be short-term and minor.

Alternative 3 would include numerous provisions that would improve the protection of soils and vegetation, compared to the no-action alternative. Except as noted, all these measures would have long-term, negligible or minor, beneficial impacts.

- the addition of the new management zones and carrying capacity framework (minor to moderate impact)
- improved protection of the lands in the boundary adjustment area (minor to moderate impact)
- the revegetation of lands near the Carbon River entrance after the removal of maintenance and employee housing facilities and the installation of picnic sites
- a reduction in dust and other pollutants from vehicle traffic through the introduction of shuttle services

- a reduction of impacts on roadside vegetation through the elimination of overflow parking
- improved protection of soils and vegetation from winter activities

Because alternative 3 would limit the use of pack stock to just six trails and roads, the introduction of invasive plants from animal feed, pack equipment, and the animals themselves would be eliminated along other trails in the park (albeit not as much as alternative 2). This action would have a minor, long-term, beneficial effect on the park's vegetation and soils.

Opening the Westside Road to high-clearance private vehicles would have a higher potential to result in new exotic plant infestations compared to the previous alternatives. Aside from educating visitors, little if anything could be done to prevent the introduction of nonnative plants in the area from private vehicles. As a result, there could be a minor to moderate adverse impact on native species along the roadside in this part of the park.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. This alternative's contribution to the adverse cumulative impacts would be minor and primarily short-term. However, preserving vegetation and preventing soil erosion in the park under the carrying capacity framework, along with protecting forests in the boundary adjustment area, would provide an incremental benefit to the protection of soils and vegetation in the region.

When the cumulative effects of actions by others and other actions in the park were combined with impacts associated with this alternative, there would be minor to major long-term adverse cumulative impacts on soils and vegetation in the region, primarily from

the edge effects of logging and land development on vegetation and soils.

**Conclusion.** This alternative would result in long-term minor to moderate beneficial effects on soils and vegetation. Some contributing factors be the better protection of resources through implementing the carrying capacity framework and new management zones, protecting about 1,063 more acres along the Carbon River as a new part of the park, and restoring developed areas near the Carbon River entrance. Minor short-term adverse impacts on localized areas would result from construction projects under alternative 3. Minor to moderate long-term adverse impacts could occur from the spread of nonnative plants along the Westside Road. Although there probably would be minor to major long-term adverse cumulative impacts on vegetation and soils in the region, primarily due to logging and land development, the alternative's contribution to these adverse cumulative impacts would be minor. By preserving vegetation and preventing soil erosion in the park, this alternative would result in an incremental beneficial effect.

### **Wildlife**

**Analysis.** Compared to the no-action alternative, alternative 3 would have a minor to moderate long-term beneficial effect on wildlife. Although both alternatives would have similar, small increases in adverse effects associated with slight increase in visitation, alternative 3 would include several management actions to improve conditions compared to those that would occur under alternative 1. In addition, it would extend National Park Service protection to about 1,063 more acres of wildlife habitat.

Alternative 3 would result in temporary adverse effects on wildlife habitat from construction projects both within and outside the park, similar to those described for alternative

2. These effects would be localized and would be mitigated to the extent possible. As a result, adverse impacts from construction activities on wildlife would be short term and minor.

As in the other alternatives, with increased use of the park there would be a higher potential for wildlife mortality due to wildlife being hit by vehicles, particularly in areas with short sight distances and/or at dusk and dawn when light conditions were poor. Wildlife such as deer and elk would be particularly susceptible to collisions. Although some animals would be injured or killed, it is not expected that the number of collisions would dramatically increase. Low posted speeds also would help reduce mortality. Thus, roadkills resulting from alternative 3 would have a minor impact on wildlife populations in the park.

Opening the Westside Road to private high-clearance vehicles would have the potential for several impacts on wildlife. Increased human use along Westside Road would cause negligible to minor adverse effects because this road is already accessible for hiking and biking. There would be a higher potential in this alternative for vehicle-wildlife collisions compared to the other alternatives. Noise from vehicles also would be more likely to disturb wildlife near the road, startling some animals, probably causing some individuals to move away from the road. Frequent loud noise could affect communication between individual animals, affecting breeding and predator-prey relationships. There might be some minor changes in the behavior and distribution of bird and mammal populations in the vicinity of the road.

In addition, depending on the volume of traffic, vehicles could fragment the habitats of some species. However, the existing wildlife community probably already has been affected to an unknown degree by the road and associated human activities. Thus, operating vehicles on the road would not

substantially alter wildlife populations in the area. Any impacts on the wildlife populations in the area would be minor to moderate.

If the Westside Road was closed after a major washout, local effects would return to current levels. Similarly, if Carbon River Road was closed, there would be a minor beneficial effect on wildlife from the reduction in vehicular and human activity along the road.

Removing housing and maintenance facilities from the Carbon River entrance could adversely affect bats, if they used the buildings for roosting. Therefore, site surveys would be conducted before building removal. If bats were found to inhabit the buildings, mitigating measures would be carried out to provide replacement roost areas; therefore, the effects would be negligible.

Alternative 3 would include several provisions that would improve the protection of wildlife and habitat, compared to the no-action alternative. Except as noted, all these measures would have long-term beneficial effects.

- application of the new management zones and carrying capacity framework (moderate effect)
- improved protection of the lands in the boundary adjustment area (minor to moderate effect)
- revegetation of lands near the Carbon River entrance following the removal of maintenance and employee housing facilities and installation of picnic sites (negligible to minor effect)

Alternative 3 would encourage more winter use in the park. Increased activity along Westside Road, State Routes 410 and 123, and areas that could be accessed from these roads could adversely affect wildlife species that are active in the winter, which is a vul-

nerable time. For example, improved human access could provide additional stress to mountain goats in the White River Valley area. Under the carrying capacity framework, the National Park Service would monitor visitor use and wildlife populations. If triggers were exceeded, the National Park Service would take management actions, such as restricting off-trail travel, closing areas, or limiting party sizes. As a result, these long-term, adverse impacts would be minor. Although adverse effects would occur to individual animals, the use of monitoring, in conjunction with the relatively small numbers of animals involved, would ensure that neither local nor regional populations would be adversely affected.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the effects of actions by others and other actions in the park were combined with impacts associated with this alternative there would be major long-term adverse cumulative impacts on wildlife in the region, primarily because of the effects of logging and land development outside the park.

This alternative's contribution to the adverse cumulative impacts would be minor and primarily short-term. However, preserving wildlife habitat in the park under the carrying capacity framework and eliminating potential impacts on habitat in the boundary adjustment area would provide an incremental benefit for wildlife in the region.

**Conclusion.** This alternative would result in long-term minor to moderate beneficial effects on wildlife. Some contributing factors would be better protection of resources through implementing the carrying capacity framework and new management zones, the protection of about 1,063 more acres of wildlife habitat along the Carbon River as a new part of the park, and the restoration of

vegetation in the Carbon River entrance area. Minor short-term adverse impacts on localized areas would result from construction projects. Minor to moderate adverse long-term impacts would result from increased visitor use along Westside Road. Increased human presence in the winter would have a minor long-term adverse effect on the relatively small numbers of animals that inhabit the improved winter use areas.

Cumulative effects would include major long-term adverse impacts, primarily due to habitat loss associated with logging and land development outside the park. This alternative's effects on these adverse cumulative impacts would be minor, and by preserving wildlife habitat in the park, the alternative would have an incremental beneficial effect.

### Special Status Species

**Analysis.** Alternative 3 would be likely to adversely affect the northern spotted owl because of the effects of winter plowing of State Route 410 in the northeastern part of the park. This alternative would not be likely to adversely affect any other special-status species. However, some inconsequential changes to habitat or loss of individuals might occur, as described below.

This alternative would include the same survey, avoidance, and mitigation provisions that were described in the analysis for the no-action alternative (continue current management). In addition, this alternative and the preferred alternative would employ the same management zones and triggers for defining when management actions were required. Taking management actions to avoid disturbance from human activity would have a beneficial effect on preservation of habitat for special-status species.

Alternative 3 would not be likely to affect any of the following special-status species. The

bases for these conclusions would be identical to those described under the no-action alternative.

- bald eagle
- peregrine falcon
- ferruginous hawk
- Larch Mountain salamander
- Van Dyke's salamander
- valley silverspot
- whulge checkerspot
- Fender's soliperlan stonefly
- state-listed sensitive plant species

The impact analysis is arranged by groups of species with similar habitat requirements. For most species, the impacts under alternative 3 would be essentially the same as for alternative 1. The analysis presents only those effects that would be different from the no-action alternative (continue current management).

Marbled murrelet, northern spotted owl, and northern goshawk — Alternative 3 would not be likely to adversely affect the marbled murrelet or northern goshawk. As discussed below, the effects of winter plowing of State Route 410 would be likely to adversely affect the northern spotted owl.

Alternative 3 would include winter plowing of State Route 410 and an additional segment of State Route 123. Sno-parks would be developed at the end of the plowed segments of these two state routes. The effects from winter plowing and related activity would not be likely to adversely affect northern goshawks or marbled murrelets, because they are not known to nest in these areas, nor would the plowing of State Route 123 be likely to adversely affect northern spotted owls because they are not known to nest along the stretch of road that would be plowed. However, snow plowing could adversely affect northern spotted owls, which nest in areas along State Route 410. Compared to the no-action alternative, the plowing and increased visitor

use could disturb owls during their early nesting season, and particularly could disrupt nest-site selection. Plowing under the no-action alternative would be less likely to disrupt nesting because it would occur primarily in the spring, rather than regularly throughout the winter.

Permitting high-clearance private vehicles on the Westside Road would not be likely to adversely affect northern spotted owls, marbled murrelets, or northern goshawks. Although private vehicle use would increase the number of visitors, who would have easier access to areas along the Westside Road, such use would occur over the broad area covered by the road, and the resulting effects (noise and disturbance) would be localized and of short duration. As in alternative 2, there would be the potential for northern spotted owls to be hit by vehicles, resulting in death or injury. The probability of this occurrence would be small (although greater than in alternative 2) because vehicles on the Westside Road would travel at slow speeds and would primarily use the road during daylight hours in the peak summer season. If this alternative was implemented, subsequent environmental analysis would be done when the park's detailed transportation plan was developed to determine if there would be a need to restrict use of the road to minimize or avoid impacts on these species. With appropriate mitigation, opening the Westside Road to private vehicles might affect, but would not be likely to adversely affect, the three species.

As in alternative 2, minor construction would be carried out in areas of northern spotted owl or marbled murrelet habitat. Restricting construction activities near nest sites during the breeding season should avert disturbance to these birds. Temporary localized disturbance of individual birds could occur during other seasons. Removing employee housing and maintenance facilities at the Carbon River entrance and installing picnic sites would be unlikely to displace owls, murrelets, or gos-

hawks because this activity would occur in a previously disturbed site.

Compared to alternative 1, the carrying capacity framework associated with this alternative would improve the protection of habitat for special status species by establishing triggers to ensure that visitor uses and management actions did not adversely affect the habitats. If monitoring indicated potential concerns, management actions such as closures could be implemented to protect these species.

As in alternative 2, the proposed Carbon River boundary adjustment would protect marbled murrelet critical habitat and other special species, which would have a beneficial long-term effect. The proposed improvements, which would take place on previously disturbed areas, would be unlikely to adversely affect murrelets.

Olive-sided flycatcher — Implementing alternative 3 would not be likely to adversely affect this species. Most effects would be identical to those described for the no-action alternative (continue current management). Alternative 3 would include increased access to some areas through road openings and shuttle services. It also would include the construction of additional picnic and other visitor facilities. However, most of the changes would be carried out near existing developed areas, so they would have little effect on the montane meadows and subalpine parklands that are the prime habitat for this species. Protection of these areas could be improved under the alternative 3 prescriptive management zones.

Canada lynx, gray wolf, grizzly bear, California wolverine, and pacific fisher — Alternative 3 would not be likely to affect any of these species. Most effects, including those on the potential future reestablishment of these species, would be identical to the no-action alternative (continue current management).

Plowing portions of State Routes 410 and 123 would have only minimal effects on the amount of suitable habitat for these species in the park, because there is already non-vehicular use of these roads in winter, and there are high levels of activity at the Crystal Mountain ski resort, a short distance to the east. Potential winter habitat for these species west of these roads would remain intact. Similarly, plowing of Westside Road would not fragment potential habitat for these species.

Long-eared myotis, long-legged myotis and Pacific Townsend's big-eared bat — This alternative would not be likely to adversely affect these species. The impacts would be the same as for alternative 1, except that removing the maintenance and housing facilities at the Carbon River entrance and building additional picnic facilities in the Westside Road, Mowich Lake, and Carbon River areas potentially could remove some roosting sites. These represent only a small portion of the available roosting sites in the park, and their loss would be mitigated by surveys and other actions, potentially including the construction of new roosting sites.

Chinook salmon, Coho salmon, bull trout, and coastal cutthroat trout — This alternative would not be likely to adversely affect any of these fish species. If visitors impact riparian areas, under alternative 3 indicators and standards would result in management actions that would protect streambanks.

Paving a short portion of Mowich Lake Road could reduce the amount of sedimentation affecting the Mowich River, but runoff from the paved surface could carry other pollutants. Any effects would be slight and localized in relation to stream loadings in the entire Mowich River drainage.

Opening Westside Road in winter would not affect these species because, based on surveys, Tahoma Creek is not considered primary habitat for these species. Construction activities, including the removal of maintenance and

employee housing facilities from the Carbon River entrance, minor improvements to roads, and construction of new picnic areas, could result in construction-related sedimentation. However, best management practices to control sedimentation would be employed, and the construction would be localized and temporary, and would affect only short lengths of stream-bank. Therefore, construction would produce only minor short-term adverse effects.

Red-legged frog, tailed frog, cascades frog, western toad and California floater — Alternative 3 would not be likely to adversely affect these species and would produce effects similar to those under alternative 1. The alternative 3 management zones that would protect wilderness areas would provide a long-term beneficial effect. Impacts from the paving of a short portion of Mowich Lake Road and from construction would be similar to those described above for the fish.

Opening Westside Road to Tahoma Vista in winter could result in some minimal increase in sedimentation. These would be localized and negligible in comparison to natural sources of sediment.

Winter plowing of roads could delay melt-out in the spring and delay breeding for frogs along the roadside. The delays are likely to be within the normal variability of the breeding season and would not produce adverse effects.

**Cumulative Impacts.** The effects of actions by others and other actions in the park would be identical to those described for the no-action alternative. When the effects of actions by others and other actions in the park were combined with impacts associated with this alternative, the cumulative effect of all of these actions would be likely to adversely affect special-status species in the region, with major, long-term, effects primarily because of the effects of logging and land development outside the park. Alternative 3 would contribute to these adverse effects, because of the

adverse effects on northern spotted owl resulting from the winter plowing of State Route 410.

**Conclusion.** Alternative 3 would be likely to adversely affect the northern spotted owl through the winter plowing of State Route 410 in the eastern part of the park. Continued human use, along with the expected increases in visitor use in the park, would cause disturbance to individuals of this and other special-status species. Opening the Westside Road to private motor vehicles also might affect, but would not be likely to adversely affect, northern spotted owls, marbled murrelets, and northern goshawks. The survey, avoidance, and mitigation actions that the National Park Service would take would ensure that, except for effects of snow plowing on the northern spotted owl, alternative 3 would not adversely affect any species of federal or state status.

When the effects of actions by others and other actions in the park were combined with the effects of this alternative, the cumulative effects of the actions would be adverse effects on special-status species in the region. Alternative 3 would make a minor contribution to these adverse effects due to the adverse effects of winter plowing of State Route 410 on nesting spotted owls.

## IMPACTS RELATED TO GEOLOGIC HAZARDS

**Analysis.** As under alternative 1, the expected slight long-term increases in the number of visitors to the park would expose more visitors to volcanic and nonvolcanic hazards. In addition, alternative 3 would have the following effects.

In comparison to alternative 1, park visitors and employees would receive additional information about the threat of geologic hazards and actions to take in case of specific

events. These visitor and employee information sources would increase knowledge about the geologic hazards that exist in the park. The dissemination of information would provide valuable facts that could reduce the injury and loss of life associated with these risks, constituting a minor beneficial effect.

Allowing high-clearance vehicles to use Westside Road would improve accessibility to this area, which is subject to debris flows and, at the southern end, rockfalls. Compared to the no-action alternative, this would result in the exposure of more people to risks from these events, although the frequency of such events, and therefore the level of impact, would not change. The adverse impacts would remain major to moderate along the southern portion of the road.

Winter use, including skiing, snowshoeing, snowboarding, and overnight camping would increase in several areas of the park compared to alternative 1. The adverse impacts from the risk of avalanches therefore would increase. In particular, a portion of State Route 410 that is subject to avalanches would expose visitors and employees to additional risk compared to the no-action alternative. This risk would represent a moderate to major long-term adverse impact.

Impacts from flooding hazards and debris flows would be reduced in comparison to alternative 1 through the removal of administrative and maintenance facilities from the Carbon River entrance. This would result in a minor beneficial effect.

Most new visitor facilities under this alternative would not be located in debris flow zones or areas subject to nonvolcanic hazards. Therefore, there would be no impact from the construction of these facilities. However, there would be a minor adverse impact from the new picnic sites at the Carbon River entrance, which would expose visitors to flooding hazards and debris flows.

**Cumulative Impacts.** No cumulative impacts have been identified because the impacts of alternative 3 would not add to or decrease the impacts from hazards in other locations.

**Conclusion.** Like the other alternatives, alternative 3 would result in major to negligible impacts from volcanic and nonvolcanic hazards, presenting risks to visitor and employee safety. However, compared to alternative 1, alternative 3 would result in a slight reduction of risk to volcanic geologic hazards by providing better information. Although both alternatives would have similar increases in risk associated with increased visitation, alternative 3 would include a minor beneficial effect from the removal of administrative and maintenance facilities from the Carbon River entrance area, which is subject to debris flows and floods. Alternative 3 also would cause a minor adverse impact due to the new picnic sites at the Carbon River entrance, which would expose visitors to the risk of a debris flow.

Exposing visitors to nonvolcanic hazards would increase compared to alternative 1 because increased winter visitation and the use of high-clearance private vehicles on Westside Road would expose more visitors to risks of avalanches, debris flows, and rock-falls. In particular, opening a part of State Route 410 that is subject to avalanches would have a moderate to major adverse impact. Compared to the no-action alternative, improved information could reduce injury and loss of life when a geologic event occurred. No cumulative impacts have been identified.

## **IMPACTS ON CULTURAL RESOURCES**

### **Archeological Resources**

**Analysis.** Like alternative 1, alternative 3 would result in small increases in human-caused erosion of archeological resources due to increase in visitation. New construction under alternative 3 could affect currently

unknown archeological resources if avoidance was not feasible at a location.

No direct impacts on known archeological resources would occur under alternative 3. However, undertakings involving ground disturbance for new construction could affect unknown archeological resources. If such resources were identified during ground disturbing activities, the park staff would implement appropriate measures to avoid or otherwise mitigate resource impacts in accordance with Section 106 (National Historic Preservation Act) procedures and other applicable cultural resource guidelines and regulations, such as the Archeological Resources Protection Act. If avoidance was not feasible at a location, there could be an adverse effect on archeological resources from construction under alternative 3.

Erosion of archeological resources is often associated with the creation and use of social trails. Compared to the no-action alternative, this situation would be improved under alternative 3, which would include additional measures to keep visitors on designated trails. Alternative 3 would also eliminate overflow parking, which is a key contributor to social trail creation as visitors walk cross-country from where they parked to a developed area. These measures would assist the National Park Service in meeting site protection objectives.

**Cumulative Impacts.** Other actions outside the park and other actions in the park would be the same as those described for alternative 1. When these actions were considered along with this alternative, there would continue to be a major, long-term, adverse, cumulative effect on archeological resources in the region. This would occur because of development outside of the park that would impact sites without recordation. The contribution of alternative 3 to this adverse effect would be small and, because mitigating measures adopted by the park require avoidance and

protection of these resources, this alternative would be expected to preserve archeological resources for the region.

**Conclusion.** As with alternative 1, a slight increase in visitor numbers associated with alternative 3 would have no adverse effects because the park's resource protection measures would continue to be implemented. Construction activities would be expected to have minor to negligible impacts on archeological resources, although there could be an adverse effect on unknown resources. Regionally, there would continue to be a major cumulative adverse effect on archeological resources. However, the contribution of alternative 3 to this adverse effect would be small in comparison to other actions.

### **Ethnographic Resources**

**Analysis.** Alternative 3 would have the same absence of adverse effects on known ethnographic resources that was described for alternative 1. Should ethnographic resources be identified, the National Park Service would ensure that efforts were made to avoid or appropriately mitigate impacts on such resources. Tribal preferences regarding the confidentiality and treatment of culturally sensitive resources would be respected.

**Cumulative Impacts.** The cumulative impacts on ethnographic resources would be the same as those described for alternative 1. It is likely that numerous resource collection and traditional cultural sites have been impacted and would continue to be adversely affected, primarily by actions outside of the park. The contribution of alternative 3 to these cumulative impacts would be negligible. Because efforts would be made to avoid or appropriately mitigate impacts on ethnographic resources in the park, this alternative would be expected to preserve ethnographic resources for the region.

**Conclusion.** Although the park's ethnographic resources are largely unknown, alternative 3 would not have any adverse effects on the ability of Native Americans to procure plants within the park or on known traditional cultural properties. The alternative also would not contribute to cumulative adverse effects on known ethnographic resources that occur throughout the region.

### **Historic Resources, Including the Mount Rainier National Historic Landmark District**

**Analysis.** Compared to the no-action alternative, no adverse effects were identified as a result of implementing alternative 3. Although both alternatives would have the same effects from similar small increases in visitation, alternative 3 would have beneficial effects from actions that would help reestablish the historic roadside character of the district and reduce effects on visual character. These actions, which were described in the impact analysis for alternative 2, would be as follows:

- Reversing the flow of traffic on the Paradise Valley Road on a trial basis would help restore the historic sense of arrival and spatial sequence that visitors originally experienced as they approached the area.
- Eliminating overflow parking along roadsides would benefit the district by reestablishing the historic roadside character.

The replacement of the Sunrise Lodge with a ranger/concession facility would be the same mitigated adverse impact as noted in alternative 1.

**Cumulative Impacts.** Effects of actions by others and other actions in the park would be identical to those described for the no-action

alternative. When the cumulative effects of actions by others and other actions in the park were combined with impacts associated with this alternative, the cumulative impact would be major, long-term, and adverse, primarily because of the effects of logging and land development on historic resources outside the park. Alternative 3 would not contribute to this cumulative adverse effect. In fact, because preservation maintenance of buildings and structures would continue and portions of the historic circulation pattern and roadside character of the park would be restored, this alternative would preserve historic resources for the region.

**Conclusion.** No adverse effects from alternative 3 were identified. Benefits to historic resources, including the Mount Rainier National Historic Landmark District, would result from such actions as eliminating overflow parking within the district. Regionwide impacts would continue to have cumulative, adverse effect on historic resources, but alternative 3 would not contribute to the cumulative adverse effect.

#### **Henry M. Jackson Memorial Visitor Center**

**Analysis.** Rehabilitating the Henry M. Jackson Memorial Visitor Center under this alternative would have no adverse effect because the rehabilitation would be carried out in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (36 CFR 68) to ensure that defining architectural elements were preserved in the process of upgrading and modifying the building for continued visitor service.

**Cumulative Impacts.** Cumulative impacts would not occur because there would be no adverse effect on the Henry M. Jackson Memorial Visitor Center under this alternative, and it would not be affected by other actions.

**Conclusion.** Rehabilitating the Henry M. Jackson Memorial Visitor Center under this alternative would have no adverse effect, and no cumulative effect, on the building because the defining architectural elements would be preserved.

#### **IMPACTS ON THE VISITOR EXPERIENCE**

As under alternatives 1 and 2, and based upon a continuation of existing trends in visitation, the number of visitors to the park is expected to increase slightly over the long-term, with substantial fluctuations from year to year. It also is expected that as much as 50% of the total visitation would occur in July and August and as much as 75% would occur during the peak-use period (June–October).

This increase in annual visitation would be likely to result in more visitors during peak-use days within the peak period (sunny weekends and holidays), and it is likely that many, or most, of these additional visitors would want to go to the major activity areas (Longmire, Paradise, Ohanapecosh and Sunrise) or the popular, accessible wilderness areas (such as Spray Park, Reflection Lake and Fryingpan Creek). However, increases in annual visitation could also result in more summer visitor use on weekdays or on days with cloudy weather (off-peak days), as well as in the spring and fall shoulder seasons.

The visitor experience would be affected by changes in the access to or within the park for visitors; the range of activities available and how enjoyable these activities are; the availability of information; or the character of the wilderness experience. Impacts on the visitor experience for each of these four measures are presented in the following sections.

### Visitor Access

**Analysis.** Under alternative 3, the operation and location of the visitor entrances to the park would be unchanged. No changes would be made to the major roadways currently used by visitors to travel within the park. Road access to other trailheads and minor developed areas throughout the park would not change in most areas.

However, this alternative would open West-side Road (to Klapatche Point) for private high-clearance vehicles (rather than for shuttle service as under alternative 2). This would improve visitor access to areas north of the existing road closure. Opening an area of the park that is now available to relatively few people would result in a moderate beneficial effect on visitor access.

Visitors could also hike or bike along the road, and they would have more convenient access to trailheads and other recreational activities, including new picnic sites along the road. However, if a major washout occurred, the future use of the road would need to be reexamined. Closing the road would be an adverse impact, and depending upon the extent of the closure, the impact could be minor to major.

To improve the quality of the visitor experience and reduce resource impacts, alternative 3 would eliminate all overflow parking, and parking would be allowed only in designated spaces at visitor centers, trailheads, viewpoints, and other visitor facilities. To minimize the potential adverse effects on visitor access, elimination of overflow parking would be implemented in phases and would not occur until alternative shuttle service was operational.

Under this alternative, during the summer peak-use period, shuttle service would be provided to Longmire, Paradise, Sunrise and White River campground, and Ipsut Creek

campground. Winter shuttle service would also be provided to Longmire and Paradise. Coordination of these two actions would ensure that an effective visitor transportation system would be available and that visitors would have an alternate means of access to the park's popular destinations.

In addition, the National Park Service would use media outlets and its own education and information resources to inform park users of the change. Visitors would have improved access to information for planning their visit to the park at new visitor contact centers on major roads leading to the park. Electronic signs or other communication technologies would provide real-time information on the access to locations where parking was available. Therefore, visitors would be able to plan and schedule their activities more effectively, and they would be able to avoid areas where parking was filled to capacity or use the shuttle service.

Under this alternative, additional designated parking would be provided in some locations to improve access for visitors. A major expansion of designated parking at Paradise would provide an additional 500 spaces. A total of 120 more spaces would be added at Mowich Lake, and a small number of additional parking spaces would be designated at Sunrise and Ohanapecosh.

The combination of shuttle service, increased designated parking and expanded visitor information would improve visitor access to all the major developed areas except Sunrise and the White River campground. Eliminating overflow parking at Sunrise and the White River campground, together with a lower level of shuttle service (compared to alternative 2), might prevent some people from visiting this area. The displacement of these visitors would be a minor to moderate adverse impact, depending on how many people were displaced to other locations in the park.

In addition, during peak-use periods some visitors would not be able to park at popular locations outside the major developed areas, including some trailheads or minor developed areas such as Narada Falls and Tipsoo Lake, where there would be no alternate means of access.

Some visitors could be reluctant to use the shuttle service. These visitors could choose to visit less-used areas in the park (such as Westside Road), travel through the park for scenic driving, or travel to other destinations outside the park, depending on the recreational activities that they were seeking. Any adverse impacts would be minor and limited to times of peak use.

There could also initially be short-term minor adverse impacts during peak-use periods due to lack of visitor familiarity with the new parking regulations, shuttle services, and information programs. However, as the additional actions to provide shuttle service and improve information for visitors became established and repeat visitors became accustomed to the new regulations and were able to plan accordingly, fewer visitors would be inconvenienced. Overall, therefore, there would be a long-term moderate beneficial impact, with some localized and temporary areas of adverse impacts.

In the short term, visitor access could be disrupted during the construction of the redesigned parking area at Paradise and the rehabilitation of the visitor center. Some visitors might be redirected to remote parking sites, depending on the temporary measures that were implemented during construction. However, this would be a minor adverse impact.

As is also true for the no-action alternative, at off-peak times during the summer, during the shoulder season (May and November), and in winter, visitation is low enough that a slight increase in visitors would not be likely to

cause noticeable congestion even in most popular visitor areas, and visitors generally would be able to find parking spaces near their destinations. However, when heavy snow delayed opening the road to Paradise in winter peak periods, congestion in the Longmire area would worsen because of the elimination of overflow parking and increases in visitation. There would be a short-term moderate adverse impact on visitor access to the Longmire area during these times.

Alternative 3 would result in the same impacts in the Carbon River area as described for alternative 2. There would be minor to moderate beneficial effects from the addition of a shuttle service, which would help reduce congestion at the end of the road. Eliminating overflow parking at the Ipsut Creek campground would adversely affect some visitors who wanted to drive to this area. If the road was closed by a major washout, there would be a moderate to major long-term adverse impact on visitor access due to the closure of a popular area to vehicular access.

In the Mowich Lake area, paving the end of the road would improve the visitor experience in this area; removing the dust and ruts from the end of the road would have a minor beneficial effect. However, because most of the road would continue to be gravel, it would not likely affect the overall number of people visiting the area.

**Cumulative Impacts.** Under alternative 3, there would be long-term moderate beneficial effects on visitor access within the park, as well as short-term and long-term minor adverse impacts, and a major adverse impact in the Sunrise area.

The effects of other actions in the vicinity of the park would be similar to alternative 1, in that they could increase visitation in the park at peak times while also diverting some use from the park and stabilizing visitor use in the long term. Any increase in park visitation at

peak times would have a negative impact on visitor access within the park because the increase in visitors would occur at times when the park would already be operating near capacity.

Other past and future projects in the park have had, and would continue to have, no effects on visitor access, other than temporary minor adverse impacts during construction.

Overall, the currently planned development projects could increase the number of visitors during peak periods of park visitation. However, when combined with the generally beneficial impacts of alternative 3 on visitor access the cumulative effects on visitor access would be moderate and beneficial due to reductions in congestion and inconvenience at major visitor areas in the park.

In winter and in off-peak periods in summer, the impacts of alternative 3 would be negligible, and even with increased visitation generated by the other projects, the total visitation would be accommodated by existing parking and circulation facilities. Therefore, the cumulative impact would also be negligible.

**Conclusion.** Alternative 3 would result in moderate beneficial effects on visitor access at times of peak use through decreased traffic congestion and less difficulty in finding convenient parking at major developed areas.

Providing a shuttle system for visitors, along with improved information about access and parking, would largely mitigate any adverse effects from eliminating overflow parking. However, there could be minor short-term adverse effects from an initial lack of visitor familiarity with these measures and long-term adverse effects because some visitors would still be inconvenienced by the elimination of overflow parking.

There would be moderate long-term beneficial effects from increased accessibility in the Westside Road area, but minor to moderate adverse impacts at Sunrise and the White River campground area due to eliminating overflow parking. If the Carbon River Road was closed by a major washout, there would be a moderate to major long-term adverse impact on visitor access due to closure of a popular area to vehicular access.

Overall, actions outside the park have the potential to increase the number of visitors during peak periods of park visitation. However, when these actions were combined with alternative 3 there would moderate beneficial cumulative impacts on visitor access due to reductions in congestion and inconvenience at major visitor areas in the park.

### **Range and Enjoyment of Visitor Activities**

**Analysis.** The implementation of a carrying capacity framework, based upon the new wilderness and nonwilderness management zones proposed under this alternative, along with other actions to improve visitors' enjoyment of activities, would result in major beneficial effects on the visitor experience. Overall, park visitors' opportunities for high quality recreation activities and experiences would improve they drove park roads, hiked trails, picnicked, camped, and used other park facilities, because the park would be managed to maintain the quality of park resources and visitor experience.

The new zones show how different areas of the park could be managed to achieve desired visitor experiences and resource conditions, and they describe appropriate kinds of activities and developments. These new zones also provide a framework for managing overnight use and day-use levels in a more systematic way than the zones currently used, based on visitor experience and resource protection indicators and standards. Monitoring would

determine the conditions of resources and visitor experiences, providing information to implement management action if an out of standard condition or downward trend in the resources or visitor experience was indicated.

For example, if in monitoring indicators it was found that the quality of the visitor experience in the Grove of the Patriarchs was declining, actions would be taken to improve the conditions. A range of actions could be considered, such as giving visitors more information about how to protect fragile resources, improving the definition of trails, or redirecting visitors so that these impacts could be mitigated or reversed. Continued monitoring would enable additional actions to be taken if necessary.

With the elimination of overflow parking, visitors parking at popular areas such as Paradise and Sunrise would spend less time on peak-use days walking to and from remote parking areas or searching for a parking place, resulting in more time being available for primary activities. Those taking shuttles would be able to reach their destinations without worrying about finding a convenient parking place, and if some form of interpretation was provided on the shuttles, they could learn about the park and its resources.

Eliminating overflow parking would also improve the views along park roadways and lessen the intrusion of vehicles, which now adversely affects the enjoyment of activities at the park.

Other actions (like those of alternative 2) that would contribute to the beneficial effect on visitor activities under this alternative are as follows:

- reversing the flow of traffic on the Paradise Valley Road on a trial basis (would improve views of Mount Rainier)

- constructing a new drive-in campground and picnic area in the boundary adjustment area west of the Carbon River entrance
- constructing new picnic sites or adding sites at several other locations

Under alternative 3, plowing sections of State Route 123 (from Ohanapecoh to Grove of the Patriarchs) and State Route 410 (from the northern park boundary to the White River entrance) would give visitors more opportunities for winter activities (skiing, snowshoeing and snowboarding) in less-used areas of the park.

If Carbon River Road was closed to private vehicles by a major washout, so that people could no longer drive or take a shuttle to this popular area, there would be a moderate to major long-term adverse impact on visitors' opportunities to enjoy the park. Most visitors would not be willing or able to walk or ride horses or bikes to the end of the road and would be displaced to other areas in or outside the park.

Under this alternative, pack stock use would be prohibited on many trails. However, some trails in the northwest part of the park, as well as the Pacific Crest Trail (and connecting trails from the park), would be available for pack stock use. Because few people use pack stock in Mount Rainier, the alternative would not affect most visitors. Pack stock users still would have opportunities to use pack stock in the park. Thus, the alternative would have a minor adverse impact on visitors' opportunities for enjoyment of the park.

As in the preferred alternative, a few hunters might be adversely affected by the proposed boundary adjustment, which would eliminate hunting in this area. But this action would result in only a minor adverse impact, because hunting still would be available in the much larger expanse of Forest Service and Plum Creek lands.

Most of the new developments or other actions of this alternative would not detract from scenic views. At peak periods, noise from people and their vehicles would continue to affect visitors even outside the major activity centers, particularly at popular trail-heads and picnic areas with high visitor use. But natural sounds would still largely dominate the park as a whole.

**Cumulative Impacts.** Under alternative 3, there would be major beneficial effects on the enjoyment of visitor activities, along with some minor to moderate adverse impacts in localized areas.

As discussed in the analysis of cumulative impacts on visitor access, above, development projects in the vicinity of the park could bring more visitors to the general area, which in turn could increase visitation in the park at peak times. This potentially would have an adverse effect on visitors' enjoyment of activities in the park. Although these development projects would provide new visitor activities outside the park, potentially redirecting some visitor use away from the park at peak times, they would be unlikely to offset the attraction of the park.

Other past and future projects in the park have had, and would continue to have, minor beneficial effects by improving visitor facilities in the park.

Overall, the effects of other actions, combined with impacts of alternative 3, would result in major beneficial cumulative impacts on visitors' enjoyment of activities through the implementation of a carrying capacity framework and the new management zones proposed under this alternative, and through other actions to improve the quality of visitor facilities and recreation opportunities.

**Conclusion.** Under alternative 3, as under alternatives 1 and 2, visitors during off-peak periods would continue to enjoy a high-

quality recreation experience with the existing range of activities. However, alternative 3 would have major beneficial effects not only by decreasing congestion and intrusion of vehicles during peak periods, but also by improving the quality of facilities and, under the carrying capacity framework, maintaining the quality of the park's natural and cultural resource base for the enjoyment of all visitors. On the other hand, if the Carbon River Road was closed due to a major washout, there would be a moderate to major long-term adverse impact on visitor experiences in the park.

Overall, other projects have the potential to increase the number of visitors to the park during peak periods of visitation with potential negative effects on congestion and crowding in the park. However, when combined with the impacts of alternative 3, there would be major beneficial long-term cumulative impacts on visitors' enjoyment of activities from the actions of this alternative.

### **Convenience and Accessibility of Information**

**Analysis.** Under alternative 3, current opportunities for information, orientation and interpretation would be continued at existing locations. In addition, new information programs and facilities would be provided. Interpretive programs at park visitor centers and museums would offer more in-depth and focused interpretation (e.g., interpreting topics relevant to a site). For example, cultural history and river ecology could be emphasized at Longmire, volcanoes and geology at Sunrise, and subalpine and alpine ecology at Paradise. A major rehabilitation or replacement of the audio-visual programs and exhibits would be implemented in visitor centers and ranger stations in the park, and some limited form of interpretation would be offered on shuttles serving visitors.

New information programs and facilities would be the same as those offered under alternative 2, including several staffed summer visitor welcome centers on corridors leading to the park. Media messages, the Internet, and electronic signboards would give visitors information on parking availability and activities before they arrived at the park.

In the short-term, the new programs and facilities would be likely to have a moderate beneficial effect on the visitor experience. In the long-term, as the programs became established and visitors became familiar with the locations and services of the new facilities, there would be a major positive impact, particularly since increased visitation, the elimination of overflow parking, and the implementation of a carrying capacity framework could make access to some popular locations difficult for some visitors.

**Cumulative Impacts.** Under alternative 3, there would be long-term beneficial effects. As was discussed above in the analysis of cumulative impacts on visitor access, development projects in the vicinity of the park could bring more visitors to the general area, which could also increase visitation in the park. To some extent, these projects could also provide expanded information about the region and potentially the park, and with the expanded park information programs under this alternative, it would be possible to better coordinate the overall regional availability of information. Implementing these opportunities to improve access to visitor information would have beneficial effects, particularly if they were incorporated as part of a broader program of information for the park.

When these effects were combined with the major beneficial effects of alternative 3, there would be major beneficial long-term, cumulative effects on the convenience and accessibility of information. This impact would result from implementing improved park information programs that would be part

of a broader effort to provide expanded information about the region.

**Conclusion.** Alternative 3 would result in major beneficial effects because it would allow visitors to obtain information more easily from the greatly expanded information programs and visitor contact facilities.

There would be major beneficial long-term, cumulative impacts on the convenience and accessibility of information due to implementing improved park information programs as part of a broader effort to provide expanded information about the region.

### **Wilderness Values and Experiences**

**Analysis.** Under alternative 3, as under alternative 2, the current management zones would be replaced by new management zones, and a new carrying capacity framework would be implemented. Current trailside camps, camping and climbing restrictions (different party size limits and campsite locations), generally would continue in the new zones.

**Opportunities for Solitude** — The application of new zones and the carrying capacity framework would have the same effects as those described for the preferred alternative. Outstanding opportunities for solitude would be maintained through the foreseeable future in the pristine and primitive zones, which account for most (about 92%) of the wilderness area. Both small and large groups could find solitude.

In some popular areas, such as the Spray Park, Fryingspan Creek, and Reflection Lake areas, the application of carrying capacities in the new zones could result in actions such as informing visitors about other destinations or instituting reservation systems or lotteries. These actions would decrease existing use levels and thus increase opportunities for solitude in the summer. From the perspective

of users in the wilderness area, the alternative would have a positive effect.

Elsewhere in the wilderness area, away from the high-use nonwilderness areas, use levels could increase in many areas that now have low levels of use. If use levels increased, there would be decreased opportunities for solitude. However, over the life of the plan the magnitude of the increase would not be expected to substantially affect the opportunities for solitude on most wilderness trails.

Alternative 3 differs from alternative 2 in the management of Westside Road in that the road would be open to private high-clearance vehicles. Thus, with more use on the road, this alternative would have both a positive and negative effect on solitude in the adjacent wilderness area: more people could go into the wilderness area in this part of the park and find opportunities for solitude, but with more users there also would be a decrease in solitude in the wilderness area near the road.

In addition, under alternative 3 private vehicles would not be allowed on Carbon River Road. However, with shuttles providing an alternate means of access, the number of people going into the wilderness area would not substantially change from current levels. Therefore, there would be no effect on the opportunities for solitude.

Overall, this alternative, like alternative 2, would have a beneficial effect on opportunities for solitude ranging from negligible to minor impacts in less popular areas to moderately beneficial effects in more frequently used areas.

**Opportunities for Primitive, Unconfined Recreation** — Overall, alternative 3 would have the same effects on this wilderness value as those described for alternative 2. The application of the new zones and carrying capacity framework would have a positive effect, ensuring that in most of the wilderness

area people would not be impeded in their trips. Reopening Westside Road to high-clearance vehicles also would increase the opportunities for unconfined primitive recreation in the adjacent wilderness area.

On the other hand, the zones also would increase restrictions on where and when day hikers, backpackers, and climbers could go in the wilderness area. In a few popular areas such as Spray Park, Fryingpan Creek, Comet Falls, and Reflection Lakes, visitors potentially could find that additional management actions under the carrying capacity framework (listening to education programs, getting permits or reservations, or even finding themselves being turned away at certain times) would affect their opportunities. Thus, compared to today, visitors probably would have less freedom to hike when and where they wanted to in the wilderness area.

If use limits had to be instituted, varying numbers of users would be redirected to other destinations. From the perspective of visitors who could not hike where they wanted to, the new zones and carrying capacities could be viewed negatively, particularly if the visitors were displaced and could not find an acceptable substitute area to visit in the park or adjacent areas. However, this could be mitigated through the expanded information programs and facilities, so that visitors were provided with advanced information about high use areas, were given other options on where to go, and could understand the benefits.

Some visitors still would be likely to perceive the action negatively, but overall most visitors would gain a positive experience from the quality of opportunities for primitive recreation. Over the long term, as the expanded information programs and facilities became well established and visitors became accustomed to using them, this alternative, like alternative 2, would be expected to result in a moderate to major beneficial effect.

**Naturalness** — The application of the zones and carrying capacities would have a positive effect, ensuring that signs of human impacts (bare ground, trampled vegetation, social trails) would not substantially increase in the future, and in fact would decline in some areas. Some high use areas such as Spray Park probably would still show signs of human use for many years, but this would be expected to improve as park staff restored these areas.

Opening part of Westside Road to private vehicles should not affect most visitors' perception of the wilderness area's natural quality. In a few places, people would be able to see additional activity and vehicles on the road from the wilderness area, but most visitors would not see this as negatively affecting the perception of naturalness.

Actions to manage trail use under this alternative, such as more intensive visitor education, increased ranger patrols, signs, or fines for going off-trail, would have a positive effect on maintaining naturalness in the wilderness. In addition, other actions that could be taken to implement the new framework, such as maintaining or restoring natural screening between campsites in the wilderness area, would increase the sense of naturalness.

Overall, this alternative, like alternative 2, would result in a long-term moderate beneficial effect on naturalness in the wilderness.

**Cumulative Impacts.** There would be moderate to major beneficial effects on wilderness values in the park due to increased opportunities for solitude and primitive recreation and the preservation of naturalness.

As was discussed above in the analysis of cumulative impacts on visitor access, development projects in the vicinity of the park could bring more visitors to the general area. This would be likely to increase day and overnight use in the wilderness slightly, which

would have an adverse effect on opportunities for solitude and primitive, unconfined recreation.

If national forest wilderness areas and other national parks in the region began proactive visitor management programs (e.g., instituting reservation systems or use limits), visitors could be redirected or turned away from a number of wilderness areas in the region at peak times when more visitors also were being redirected from popular wilderness areas in the park. This would have minor effects in the short term but would result in greater effects in the long term.

As discussed under alternative 1, development along the eastern boundary of the park would adversely affect the naturalness of the park's wilderness landscape by increasing noise and views of people, ski lifts, and other activities from within the park. On the west side of the park, planned timber sales could affect the naturalness of the wilderness in the park through noise from the timber operations in the short term and in the long term because the timber cuts would continue to be visible from the park. In addition, increased popularity of the Tahoma Trails system in winter could result in a decrease in solitude, although probably only a small number of users would be affected.

Other actions in the park, such as natural and cultural resource studies and resource management actions, would be expected to have a negligible to minor beneficial effect on wilderness values by improving the opportunities for primitive recreation and maintaining the naturalness of the wilderness.

In summary, when all the potential actions outside of the park were considered together with the other actions in the park and the impacts of this alternative, there would be major to moderate beneficial effects on opportunities for solitude and primitive recreation in the wilderness area due to the

effects of the proposed carrying capacity framework and management zones under this alternative.

There would also be minor to major long-term adverse cumulative impacts on the naturalness of the park's wilderness areas, although the park's contribution to these impacts would be negligible.

**Conclusion.** Overall, alternative 3 would result in a long-term moderate beneficial effect on wilderness values, with some major beneficial effects along with some moderate negative impacts due to increased restrictions on wilderness recreation opportunities.

In both summer and winter, opportunities for solitude would be maintained in most wilderness areas and improved in some. The alternative would have a positive effect in maintaining opportunities for primitive, unconfined recreation in winter and summer in most of the wilderness area. These opportunities would increase in a few areas where access would be improved. However, increased restrictions could affect wilderness users, some of whom might feel their freedom was being adversely affected. There would be a positive effect from maintaining the perceived naturalness of the wilderness, with reduced signs of human impacts.

When all the potential actions outside of the park were considered together with the other actions in the park and the impacts of the preferred alternative, there would be major to moderate beneficial effects on opportunities for solitude and primitive recreation in the wilderness area due to the effects of the proposed carrying capacity framework and management zones under this alternative.

## IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT

### Regional Context

**Analysis.** The impacts on the regional socioeconomic environment under this alternative would be similar to alternative 2. The alternative would increase employment at the park by 21 employees. Construction activities would have total estimated gross costs of approximately \$42.8 million and would be likely to increase employment, earnings, and taxable sales at the regional level. This still represents a relatively modest dollar figure, given the magnitude of the four-county regional economy.

The park would continue to be an attraction in drawing tourists to the region, although the overall effect on the nearly \$6 billion regional tourism expenditure would be small. As under alternative 2, some of the management and actions could result in redirecting visitors from the park, particularly in summer. On the other hand, new or improved facilities and opportunities could attract more people to the region and the park. However, even if redirected from the park, visitors would be likely to stay in the region; therefore, there would be little effect on the overall regional economy.

Overall, in a regional context, the socioeconomic impacts of alternative 3 probably would be minor but beneficial, due to the effects of increases in park employment and construction as well as the continuing attraction of the park for tourists to the region.

**Cumulative Impacts.** As for alternatives 1 and 2, there would be major beneficial and adverse cumulative socioeconomic impacts on the region. However, although alternative 3 would have a small beneficial effect on regional tourism and expenditures, it would be unlikely to cause major changes in the trends of regional population or economic growth;

therefore, its overall cumulative impacts would be small.

**Conclusion.** Alternative 3 would result in a minor beneficial effect from the increases in park employment and construction and the continuing attraction of the park for tourists to the region. However, alternative 3 would have only a small effect on the overall cumulative impacts of regional economic growth.

### **Gateway Communities**

**Analysis.** The impacts of this alternative on gateway communities would be the same as those of alternative 2. Visitor use levels would reach capacity maximums in some areas of the park during periods of peak visitor use (due to the elimination of overflow parking); however, the public would be encouraged to visit less crowded parts of the park during the peak-use times or to visit at less crowded times (weekdays or early morning or late afternoon). The new developments and efforts to redirect visitors spatially and temporally would be in place and would enable the park to better serve visitors.

The effects on tourism, including visitation patterns and visitor expenditure levels, from establishing a carrying capacity framework and prohibiting overflow parking, while at the same time developing new facilities outside the park to better serve visitors, would be minor and mostly beneficial, particularly if measures were employed to inform visitors outside of the park on whether park activity areas are open or closed. Such measures could include media messages, the Internet, and electronic signs along roads to the park.

The prospect of less crowding during off-peak times could encourage visitors to spend more time both in the park and within the gateway communities, which might encourage more tourism expenditures in gateway communities. Nonetheless, some visitors might be

discouraged from visiting the park during peak-use days or might choose to use other regional recreation resources.

The gateway communities would benefit from the new welcome centers and outreach services provided to inform and orient visitors to the park and nearby nonpark recreation areas and facilities such as Crystal Mountain Ski Area and Resort. It is also possible that new shuttle service would be provided from a site or sites near these communities. The communities would be likely to experience increases in tourism-related expenditures because more tourists would stop at these locations and nearby areas for information and orientation.

This alternative would result in the expenditure of additional NPS funds within the regional economy, which would contribute to the economies of the gateway communities as well as the region's economy.

Overall, alternative 3 would be expected to have a minor to moderate beneficial effect on the socioeconomic environment of the gateway communities.

**Cumulative Impacts.** The cumulative impacts of alternative 3 would be similar to those for alternatives 1 and 2. As a result of increased visitation to the park over the years, business and residential development has grown along the access corridors. This has had a moderate beneficial impact on the local economy, which is expected to continue. Other NPS actions in the park have and would continue to have a minor indirect beneficial effect on gateway communities by supporting increased visitation.

Other actions outside the park would also be likely to have minor to moderate beneficial impacts by leading to increases in business in the gateway communities. Recent regional planning initiatives, particularly by Pierce County, could help to ensure long-term eco-

conomic health and continued benefits from increased park visitation. The impacts of the alternative, when combined with the other actions, would result in a moderate beneficial cumulative effect with respect to the gateway communities. Alternative 3 would contribute substantially to this beneficial effect.

**Conclusion.** Under this alternative the visitor welcome centers, shuttle staging areas, park construction activities, and increased park visitation would have a moderate beneficial impact, on the socioeconomic environment of the gateway communities. When combined with other planning and development actions in the area, this alternative would also result in a moderately beneficial cumulative impact with respect to the gateway communities.

### Regional Recreational Opportunities

**Analysis.** Like alternative 2, in most cases this alternative would not be expected to cause substantial changes in the recreational use patterns of the people in the region during either summer or winter seasons. The alternative probably would result in attracting more people to the park but also would redirect some visitors to other areas. If the Carbon River Road were closed there could be additional minor long-term adverse impacts on regional recreational opportunities.

Overall, even with the additional recreation opportunities at the park, people would continue to make their selections of outdoor recreation based upon their own desires, perceptions, and availability of time and other personal resources. Therefore, it is expected that, this alternative, like alternative 2, would have a beneficial, minor impact on regional recreational opportunities.

**Cumulative Impact.** The cumulative impacts would be similar to alternative 2. Neither alternative 3 nor other NPS actions in the park would add any major new recreational

opportunities in the region. Like alternative 2, alternative 3 would have minor beneficial impacts due to improvements in the existing recreational opportunities. The completion of several proposed recreation projects, including the Train to the Mountain and the expansion of the Crystal Mountain ski area and resort, would result in an increase in the local job base as well as an increase in the number of recreation visitors to the region. Together with the improvements in national forest recreation areas in the region, as well as the additional facilities and activities proposed in the park under this alternative, there would be moderate beneficial cumulative effects on regional recreation opportunities. However, the alternative's contribution to these effects would be minor.

**Conclusion.** Alternative 3 would improve recreation opportunities in the park, but could also result in redirection of visitors to other areas at peak times as the capacity of popular areas is reached. Overall, the alternative would have a minor, beneficial impact. There would be moderate, beneficial cumulative impacts, but alternative 3 would not be expected to cause any substantial change in regional recreational opportunities and therefore would have a minor effect.

### Concessions

**Analysis.** Impacts under this alternative would be the same as for alternative 2. Eliminating overflow parking, and establishing a carrying capacity framework would result in a small decrease in the number of visitors in parts of the park, potentially affecting the business of concessioners that provide lodging, food or other services. However, this would be offset if visitors either extend their stays in the park or visit the park at off-peak times, and it is likely that there would be a slight increase in the overall number of visitors.

Like alternative 2, alternative 3 could result in an adverse impact on the business of firewood concessioners if campfire restrictions had to be instituted to protect air quality. However, these restrictions would be likely to be instituted for short periods and in specific areas and thus should have a minor to moderate, long-term impact on concessioners.

There would likely be no adverse impacts on the concessioners or other commercial businesses that provide mountaineering-related services such as guiding. Indeed, the impact may be slightly positive for such operations, as there would be less crowding of facilities, including trails, and thereby enhancing visitor experience and enjoyment. Overall, the alternative would be expected to have a minor beneficial impact on these businesses.

**Cumulative Impacts.** Alternative 3 would have similar impacts as alternatives 1 and 2, and the cumulative impacts would also be similar. Other actions in the park would have beneficial negligible effects, and recreation related development in the vicinity of the park, such as Crystal Mountain and Mount Rainier Resort at Park Junction, would have minor beneficial effects. Overall, there would be minor, beneficial cumulative effects to which alternative 3 would contribute.

**Conclusion.** Overall, the socioeconomic impacts on concessioners and other commercial businesses operating within the park would be minor, but likely beneficial, under alternative 3. The cumulative impacts, considering the positive effect on visitation of other recreation developments in the vicinity of the park, would be also be minor and beneficial.

#### **IMPACTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL**

A gradual reduction in visitor, commuter employee, and concessioner gasoline con-

sumption would be expected due to vehicles achieving better fuel economy as newer model vehicles replaced older models over time. Providing visitor and employee shuttle services on Carbon River Road and to Paradise should result in a decrease in fuel consumption throughout the park. In addition, less fuel would be consumed by visitors because they would know in advance when parking was at capacity and would not burn fuel circling and waiting for a parking space. However, the expected increase in overall visitation could increase energy requirements in general, considering that some visitors might travel long distances to visit the park.

Fuel requirements at the rehabilitated Henry M. Jackson Memorial Visitor Center would be somewhat less than for the visitor center in its current condition under alternative 1 because the heating and ventilating systems would be upgraded as part of the rehabilitation of the building, although the roof snow-melting system would not be modified.

#### **UNAVOIDABLE ADVERSE IMPACTS**

Plowing State Route 410 to provide additional winter recreation opportunities in the eastern part of the park would be likely to adversely affect nesting northern spotted owls (a special status species), but no other special status species would be likely to be adversely affected. Minor adverse impacts on other natural resources would occur in some areas throughout the park from human use and construction of new facilities in the park under this alternative.

The minor to major adverse impacts identified under alternative 1 due to exposure to visitors and employees to volcanic and nonvolcanic hazards would continue under this alternative, and additional visitors and employees would be exposed to risks from avalanches because plowing State Route 410 would allow winter access.

Alternative 3 would include the use of shuttles and the elimination of overflow parking at a number of popular nonwilderness areas during the summer season. As a result, visitor use at these areas could be reduced below current levels, depending upon the time of week and month of the year. By limiting use, some visitors in the peak summer season might not be able to access the park where they wanted to, when they wanted to, or in the manner they desired. Some visitors might be discouraged from visiting the park or displaced to less crowded places or times. Visitors who altered their visitation plans would be impacted to a minor to major degree.

Similarly, in the wilderness area, if wilderness use continued to increase, increased management could be required to protect natural resource conditions and the experience of wilderness users. Increased management could result in a loss of freedom for some visitors to visit some wilderness areas during peak-use times.

#### **IRRETRIEVABLE OR IRREVERSIBLE COMMITMENTS OF RESOURCES**

The additional energy requirements identified above would result in an irreversible commitment of resources. In addition there would be commitment of material used to construct new visitor facilities such as picnic

sites, to rehabilitate the Henry M. Jackson Memorial Visitor Center, to pave a portion of Mowich Lake Road, and possibly to build welcome centers outside the park.

#### **RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

Like all of the alternatives, under alternative 3 the vast majority of the park be protected in a natural state and would maintain its long-term productivity — only a small percentage of the park would be converted to development. In addition, under this alternative more than 800 acres of forest land included in the proposed 1,063-acre boundary adjustment area west of the Carbon River entrance would be removed from potential future timber production. There would be no other actions that would jeopardize the long-term productivity of the environment. Short-term impacts associated with construction and restoration might occur such as localized air and water pollution (see analysis of specific impact topics for detail). Noise and human activity associated with construction and restoration also might displace some wildlife from the immediate area. However, these activities would not jeopardize the long-term productivity of the environment.

## IMPAIRMENT OF PARK RESOURCES AND VALUES

During the planning process for the *Mount Rainier General Management Plan*, the National Park Service revised its national management policies. Both the NPS *Management Policies* (NPS 2001b) and NPS Director's Order 12 (NPS 2001c) require decision-makers to consider whether or not NPS actions would impair park resources or values. This policy change occurred after the draft Mount Rainier plan was published. Thus, although the draft document did not consider impairment, the final *Mount Rainier General Management Plan / Environmental Impact Statement* addresses the impairment requirement.

Under the NPS *Management Policies* (2001b), the National Park Service may not allow the impairment of park resources and values unless directly and specifically provided for by legislation or proclamation establishing the park. Impairment that is prohibited by the NPS Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. In determining whether an impairment would occur, park managers examine the duration, severity, and magnitude of the impact; the resources and values affected; and direct, indirect, and cumulative effects of the action. According to NPS policy, "An impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is: a) Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; b) Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or c) Identified as a goal in the park's general man-

agement plan or other relevant NPS planning documents."

This policy does not prohibit all impacts to park resources and values. The National Park Service has the discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impacts do not constitute an impairment. Moreover, an impact is less likely to constitute an impairment if it is an unavoidable result, which cannot be further mitigated, of an action necessary to preserve or restore the integrity of park resources or values.

After analyzing the environmental impacts described in the alternatives and public comments received, the National Park Service has determined that none of the actions in the alternatives being considered would result in an impairment to Mount Rainier National Park's resources and values.

The no-action alternative would result in several minor to moderate adverse impacts on the park's natural resources (e.g., air, water, soil), but none of these impacts would harm the overall integrity of these resources. There also could be major, long-term impacts on visitor access and enjoyment due to crowding and congestion during peak times. The quality of the visitor experience could decline for many visitors. However, these impacts would not prevent people from using the park or eliminate opportunities for people to enjoy the park during off-peak periods.

The actions in alternative 2 are intended to protect and enhance the park's natural and cultural resources and provide for high-quality visitor experiences. Overall, the alternative would have beneficial effects on such resources as air and water quality, wildlife, and historic resources. The alternative would have positive

effects on most visitors' experiences by reducing crowding and congestion.

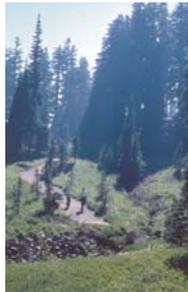
The actions in alternative 3 would be similar to those of alternative 2 but would provide some additional visitor use opportunities. Alternative 3 would have beneficial effects that would be similar to alternative 2 with regard to air and water quality, wildlife, and visitor experiences. Winter plowing of State Route 410 in alternative 3 would have the potential to adversely affect northern spotted owl nesting near the road. However, even if nesting was affected, this would not constitute an impairment because the action would not jeopardize the continued existence of the owl in the park. This action would affect only a small portion of the 68,000 acres of suitable northern spotted owl habitat in the park. Thus, although a few owls might be

affected by plowing the road, most owls in the park would not be affected and would continue to breed and use Mount Rainier.

From an overall, parkwide perspective, no major adverse impacts on the park's resources or the range of visitor experiences and no irreversible commitments of park resources would be expected in any of the three alternatives. Although the alternatives would have some adverse effects on park resources and visitor experiences, most of these impacts would be site-specific, minor to moderate, short-term impacts. None of the impacts in the alternatives would adversely affect resources or values to a degree that would prevent the National Park Service from fulfilling the purposes of the park, threaten the natural integrity of the park, or eliminate opportunities for people to enjoy the park.



# Consultation and Coordination



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## SUMMARY OF PUBLIC INVOLVEMENT

Public input was sought throughout this general management planning process for Mount Rainier. The input was used to help define the planning process to be followed, to identify the issues to be addressed in the plan and environmental impact statement, and to identify and help shape the desired future conditions and the alternatives.

The scoping process for this plan was initiated on September 27, 1994, when the *Federal Register* published a “notice of intent” to prepare an environmental impact statement. Public meetings were held November 14–19, 1994, in Enumclaw, Morton, Eatonville, Tacoma, Seattle, and Yakima to provide opportunities for interested citizens to identify issues and concerns for the plan. (The results of these public meetings were summarized in a newsletter published in the winter of 1995.)

The planning team distributed a number of newsletters and held meetings throughout the planning process. The newsletters and meetings offered opportunities for people at the local and the national levels to provide input into the plan. These forums were designed to allow for public expression and to foster dialogue between the planning team and the public and other agencies. A brief summary of the more formal of these activities follows in chronological order:

### NEWSLETTERS AND WORKBOOKS

During the planning process the team compiled a mailing list of over 1,200 names. The list included officials from state and other federal government agencies, state and federal legislators, Indian tribal governments, local and regional governments, businesses and organizations, and interested citizens. All the newsletters were also placed on the Mount Rainier Internet Web site (<http://www.nps.gov/mora/home.htm>).

Newsletter 1, published in the winter of 1995, introduced the planning process, identified the park’s purposes and significance, provided a “vision statement” for Olympic and Mount Rainier National Parks, and summarized issues and concerns raised by the public at the scoping meetings. The newsletter included a response form for people to express their thoughts and concerns about the material in the newsletter.

Newsletter 2, published in January of 1997, was a progress report, including maps and text on the park’s existing conditions and trends. The newsletter also described summer wilderness and nonwilderness management zones. Three management scenarios were presented for summer and for winter. Each scenario included an overview of a management concept, a map that zoned the park, and a brief summary of potential impacts. A response form asked readers what they liked about the scenarios, what, if anything, they would change, and why they thought changes should be made.

A supplement to the progress report was published in winter 1997–1998. This supplement gave full descriptions of the prescriptive management zones. It also introduced the concept of indicators and standards as they relate to the zones, described several preliminary indicators and standards, and discussed what these might mean for park management.

Newsletter 3, which was distributed in fall 1997, briefly discussed desired future conditions for the park and noted changes to the management zones. It also identified summer and winter issues facing Mount Rainier and listed possible options for addressing these issues.

An update letter mailed by the park superintendent on October 27, 1997, summarized the comments the planning team had received from several public meetings and identified some new ideas for addressing specific issues facing the

park. The letter also described the general management planning process.

Newsletter 4 was published in the summer of 1998. This newsletter, an update from the superintendent, described the status of the planning effort and the progress made to date. The newsletter also noted what would happen next in the planning process.

### **PUBLIC AND AGENCY MEETINGS**

The planning team held many meetings during the course of the planning process. In addition to the November 14–19, 1994, scoping meetings, the team also met with organizations and other governmental agencies to identify their issues and concerns. Planning team members met with representatives from the following groups:

- U.S. Forest Service (Mount Baker–Snoqualmie, Gifford Pinchot, and Wenatchee National Forests) on September 27, 1994
- Pierce County Planning Office on September 28, 1994
- Washington Department of Natural Resources on September 29, 1994

During the course of the planning process, the park staff met with the following various groups to brief them about the general management plan and its status:

- the staff of Congressman Norm Dicks and Congresswoman Jennifer Dunn
- the neighboring national forests
- U.S. Geological Survey, Cascade Volcano Observatory
- Washington State Department of Natural Resources
- Lewis County Commissioners

- Upper Nisqually Community Advisory Board/Pierce County Planning
- Wilkeson Town Council, Planning Commission and local citizens
- Nisqually River Council
- Tacoma and Seattle branches of The Mountaineers
- Crystal Mountain Ski Resort
- South Cascade Tourism Council
- Washington State Tourism Council
- Friends of Upper White River Valley Association
- Mount Rainier Business Association
- Mount Rainier National Park Associates
- National Parks and Conservation Association, Northwest Chapter

In addition, the planning team contacted the Washington Department of Fish and Wildlife in August 1994 to identify state threatened and endangered species. This list was subsequently updated in 1999 through the Internet (<http://www.wa.gov/wdfw/wlm/diversity/soc/endanger.htm>).

### **CONSULTATION WITH THE STATE HISTORIC PRESERVATION OFFICER**

Members of the planning team had informal consultations with the state historic preservation officer early in the planning process.

### **CONSULTATION WITH THE NATIVE AMERICAN TRIBES**

Early in the planning process numerous contacts were made with officials from four federally recognized Native American tribes with known

associations with park land (Nisqually, Puyallup, Muckleshoot, and Yakama). Newsletters were mailed to the tribes. After the draft plan was published, planning team members met with the Puyallup, Muckleshoot, Yakama, Nisqually, and Cowlitz tribes to discuss their concerns (see below).

#### **CONSULTATION WITH U.S. FISH AND WILDLIFE SERVICE AND NATIONAL MARINE FISHERIES SERVICE**

In March 1994 the planning team initiated informal consultation with the U.S. Fish and Wildlife Service to determine the presence of federally listed threatened and endangered species in Mount Rainier National Park. There were several telephone conversations with the Western Washington Office of the Fish and Wildlife Service in 1999 to discuss the project and get input from the agency on the alternatives and their potential impacts.

In September 1999, May 2000, and January 2001, the planning team requested an updated list of listed and proposed threatened and

endangered species, candidate species, and species of concern that may be present in the park. A copy of the U.S. Fish and Wildlife Service's October 1999 response to this consultation is included in appendix F. (No changes in the federal list of species for Mount Rainier have occurred since June 2000, according to the Fish and Wildlife Service.)

The planning team also informally consulted with the National Marine Fisheries Service in February 2000 to determine if any listed salmon populations inhabit the park. A summary of the telephone conversation is included in appendix F. The National Marine Fisheries Service did not provide a formal response letter on the draft plan. In a February 8, 2001, electronic message (NMFS 2001), the National Marine Fisheries Service stated that the draft plan did not have specific actions that the agency could consult on pursuant to section 7(a)(2) of the Endangered Species Act. The agency noted that it would work with the park when there is a proposed action needing Endangered Species Act consultation.

## **PUBLIC OFFICIALS, AGENCIES, AND ORGANIZATIONS TO WHICH COPIES OF THE FINAL PLAN WERE SENT**

The National Park Service is circulating the *Final General Management Plan / Environmental Impact Statement* to the agencies and organizations listed below. Those who responded to the *Draft General Management Plan / Environmental Impact Statement* are noted with an asterisk. Copies of the document were also sent to individuals who commented on the draft plan (see table 17). A complete list of individuals who received copies of the final plan is on file at park headquarters. A limited number of copies of the final plan are available upon request from interested individuals. Copies of the final plan are also available for review at the park, at libraries, and on the Internet.

### **CONGRESSIONAL DELEGATION**

Congressman Brian Baird  
Congressman Norm Dicks  
Congresswoman Jennifer Dunn  
Congressman Richard (Doc) Hastings  
Congressman Jay Inslee  
Congressman Jim McDermott  
Congressman Jack Metcalf  
Congressman George Nethercutt  
Congressman Adam Smith  
Senator Maria Cantwell  
Former Senator Slade Gorton  
Senator Patty Murray

### **STATE AND LOCAL ELECTED OFFICIALS**

Governor Gary Locke  
Representative Gary Alexander  
Representative Richard DeBolt  
Representative Christopher Hurst  
Representative Michael Stensen  
Senator Harold Hochstatter  
Senator Pam Roach  
Senator Dan Swecker  
Washington Secretary of State

King County Executive Ron Simms  
Lewis County Commissioners  
Pierce County Councilwoman Jan Sharbro  
Pierce County Executive Doug Southerland  
Pierce County Planning Commissioner  
Yakima County Commissioners  
Mayor of Buckley  
Mayor of Eatonville  
Mayor of Enumclaw\*  
Mayor of Greenwater  
Mayor of Olympia  
Mayor of Packwood  
Mayor of Seattle  
Mayor of Tacoma  
Mayor of Wilkeson  
Mayor of Yakima

### **FEDERAL AGENCIES**

Advisory Council on Historic Preservation,  
Western Office of Review  
U.S. Department of Agriculture  
Natural Resources Conservation Service  
U.S. Forest Service  
Gifford Pinchot National Forest  
Mount Baker-Snoqualmie National  
Forest  
Olympic National Forest  
Wenatchee National Forest\*  
U.S. Department of Commerce  
National Marine Fisheries Service  
U.S. Department of the Interior  
Bureau of Indian Affairs  
National Park Service  
Cascades System Support Office,  
Rivers and Trails Conservation  
Assistance  
Pacific West Region  
Regional Director  
Deputy Director  
Superintendents  
Golden Gate National Recreation Area  
North Cascade National Park  
Olympic National Park

U.S. Fish and Wildlife Service  
Olympia Field Office, Ecological  
Services\*  
U.S. Geological Survey  
Biological Research Division,  
Cascadia Field Station  
Cascade Volcanic Observatory  
U.S. Department of Transportation  
Federal Highway Administration  
U.S. Environmental Protection Agency,  
Region 10\*  
Federal Emergency Management Agency

#### **NATIVE AMERICAN TRIBES**

Cowlitz Tribe  
Muckelshoot Tribe\*  
Nisqually Tribe  
Puyallup Tribe\*  
Yakama Nation

#### **STATE AND LOCAL GOVERNMENT AGENCIES**

Interagency Committee for Outdoor  
Recreation\*  
Washington Department of Ecology  
Washington Department of Fish and Wildlife  
Washington Department of Natural Resources  
South Puget Sound Region  
Washington Department of Transportation\*  
Washington State Conservation Commission  
Washington State Office of Archeology and  
Historic Preservation  
Washington State Parks and Recreation  
Commission  
Nisqually River Council  
Pierce County Planning and Land Services  
Pierce County Public Works  
Pierce County Trails Coordinator  
Puget Sound Regional Council  
Puyallup River Council  
Thurston County Commission  
Wilkeson Planning Commission

#### **UNIVERSITIES**

University of Washington

College of Forest Resources  
University of Washington  
Pack Forest Station  
Washington State University Energy Program  
Western Washington University

#### **ORGANIZATIONS AND BUSINESSES**

Adopt-A-Beach  
Adopt-A-Stream Foundation  
Alpine Ascents International  
Alta Crystal Resort  
American Alpine Club\*  
American Alpine Institute  
American Rivers  
Bike-to-Nature  
Bluewater Network\*  
Boeing Employees Alpine Society  
Cascade Alpine Guides  
Rainier Timber Company, LLC  
Clean Prairie Association  
Cowlitz River Lodge  
Crystal Conservation Coalition\*  
Crystal Mountain Resort  
Earthjustice Legal Defense Fund  
Enumclaw Chamber of Commerce  
Enumclaw 2000  
Enumclaw Trail Riders\*  
Friends of the Earth  
Friends of Upper White River Valley  
Glacier Water Company, LLC\*  
Greater Ecosystem Alliance  
Greater Greenwater Gateway Community  
Committee  
Mazamas  
Mount Rainier Alpine Guides  
Mount Rainier Guest Services, Inc.  
Mount Rainier National Park Associates\*  
The Mountaineers,  
Tacoma and Seattle Branches\*  
Climbing Committee\*  
Naches Valley Chamber of Commerce  
National Outdoor Leadership School,  
Pacific Northwest Branch  
National Parks and Conservation Association  
The Nature Conservancy  
Pacific Northwest Regional Office

Nisqually River Education Project  
North Cascade Conservation Council\*  
Northwest Ecosystem Alliance\*  
NW Conservation Act Coalition  
Pacific Crest Trail Association  
Parkland Sports Center  
Paul Allen Group  
Plum Creek Timber Company  
Rainier Mount Business Association  
Rainier Mountaineering Inc.  
Rainier Shuttle  
REI  
River Council of America  
Sierra Club  
    Cascade Chapter\*  
    Northwest Region  
South Cascade Tourism Council  
Student Conservation Association  
Tacoma Eastern Railroad Company  
Tacoma Public Utilities  
Tacoma Wheelmen\*  
Tahoma Audubon Society\*  
Trailblazers, Inc.  
Trust for Public Lands  
Volunteers for Outdoor Washington  
Wapati Woolies\*  
Washington Environmental Council  
Washington Native Plant Association  
    South Sound Chapter\*  
Washington Recreation and Parks Association  
Washington State History Museum  
Washington Trail Association  
Washington Wilderness Coalition  
Washington Wildlife Federation  
Washington Wildlife and Recreation Coalition  
Washington's National Park Fund  
Weyerhaeuser/Cascade North Division  
The Wilderness Society  
Wilderness Watch  
Yakama Valley Museum  
Yakima Chamber of Commerce

## **LIBRARIES**

Eatonville Public Library  
Enumclaw Public Library  
King County Library  
Pierce County Library  
Puyallup Public Library  
Seattle Public Library  
Tacoma Public Library  
Timberland Library,  
    Olympia Branch  
    Packwood Branch  
University of Washington  
    Public Documents Library  
Washington State Library  
Washington State University Library  
Yakima Valley Regional Library

## **NEWS MEDIA**

C89.5 FM  
Eatonville *Dispatch*  
KCPQ  
KCTS  
King 5 TV  
KIRO  
KOMO TV  
KSTW  
Northwest Interpretive Association  
*Outside Magazine*, Northwest Manager  
*Puget Sound Business Journal*  
*Seattle Post-Intelligencer*  
*Seattle Times*  
*Seattle Weekly*  
*Tahoma News Tribune*

## SUMMARY OF PUBLIC COMMENTS ON THE DRAFT PLAN, WITH RESPONSES

### PUBLIC MEETINGS

The planning team arranged and conducted seven public meetings on the *Draft General Management Plan / Environmental Impact Statement* from December 3 through December 8, 2000. The meetings were in Seattle, Olympia, Tacoma, Enumclaw, Packwood, Yakima, and Eatonville. A total of 173 people attended the meetings, with the largest number attending the Olympia meeting (38), followed by Tacoma (36), Enumclaw (30), Seattle (28), Eatonville (25), Yakima (13) and Packwood (3). Several organizations were represented at the meetings, including the Mountaineers, Backcountry Horsemen of Washington (Enumclaw Trailriders Chapter), Washington Department of Ecology, Washington State Office of Archaeology and Historic Preservation, city of Enumclaw, and Cascadians, as well as members of the media.

At all the meetings, members of the planning team informally mingled with the attendees, listened to concerns, answered questions, and clarified points regarding the plan. Comments were recorded on flip charts and response forms. At most of the meetings the planning team gave a short overview of the plan. A question and answer period then followed in which the superintendent and planning team answered questions from the audience.

Only a few people who commented indicated which alternative they favored. The most common comments expressed at the meetings concerned the shuttles and the openings or closure of park roads. In general, there was support at all the meetings for operating shuttles in the park, including Paradise, Sunrise, and the Westside Road, although many concerns were expressed about the operation of the shuttles (how often they would run, their cost, where they would stop, etc.). Yakima residents were concerned

about the plan's lack of shuttles on the east side of the park and how they could use the shuttles.

Most people who commented supported opening the Westside Road to limited motor vehicle use (that is, shuttles). However, there were opposing views about the future closure of the Carbon River Road (if there should be a major washout) and whether or not Washington Highway 410 should be open in the winter. Many people (particularly in Enumclaw) were concerned about the closure of the Carbon River Road, saying such closure would eliminate a unique visitor experience, and some questioned whether other options might be available. A few supported closing the road because of the high cost of maintaining it. Similarly, some people favored plowing State Route 410 in winter, providing another winter visitor experience in the park, while others were opposed, citing concerns regarding resource impacts and avalanche potentials.

A variety of other comments and concerns were expressed at the public meetings, including protecting the air quality, livestock use in the park (some wanted more opportunities; others supported the preferred alternative), the proposed boundary adjustment (several people wanted a larger boundary adjustment in the Carbon River valley), the proposed new Jackson visitor center, a desire for more opportunities to use bicycles in the park, proposed road and parking changes at Mowich Lake, and the analysis in the draft document.

Many comments were of a detailed operational nature, beyond the scope of the *General Management Plan*; for example, fees or a lack of funding for the park, park housing, operating a gate system at Paradise, the possibility of not allowing motor homes in certain areas or at certain times, and requiring payment for overnight parking at Paradise. Others commented

that the NPS fee structure does not encourage shuttles to bring people to the park, and others suggested emphasizing more education and interpretation programs.

### **MEETINGS WITH TRIBES, ORGANIZATIONS, AND AGENCIES**

Members of the planning team met with the five federally recognized Native American tribes and with several other organizations that requested meetings to discuss the draft plan. Meetings were held with the Yakama Nation and the Muckleshoot Tribe in December 2000 and with the Nisqually Tribe and the Puyallup Tribe in January 2001. Planning team members also met in January with the Tacoma chapter of the Mountaineers and with the U.S. Forest Service, as well as with the Cowlitz Tribe. In February planning team members met with representatives of Pierce County.

#### **Yakama Nation**

Planning team members met with the Yakama Nation tribal council to listen to their concerns regarding the management of the park. Members of the council expressed concerns about being able to use ancestral sites and gather park resources such as huckleberries for traditional purposes. They said tribal members want to have a good working relationship with park staff, as they have with the Gifford Pinchot National Forest. It was noted that there is a need for communication between park staff and tribal members. Interest was also expressed in a lodge house being built for religious purposes in or near the park.

#### **Muckleshoot Tribe**

The planning team met with the cultural resources group of the Muckleshoot tribe. Tribal members expressed concern about parking impacts on stream and salmon, not being able to get to Sunrise in a private vehicle, and continued

closure of the Carbon River Road. They said they thought the operation of the shuttles would increase visitor numbers, and they were concerned about the impacts of increasing numbers of visitors on park resources and tribal practices and the potential for sacred areas being overrun by people.

Tribal members suggested that the plan include educating the public regarding tribal rights, that specific contemporary issues pertinent to Native Americans be recognized, that specific information regarding treaties be part of the document, and that parking spaces be provided for tribal vehicles. The concept of a "special management area" came up as applicable to the tribes regarding general locations for spiritual observation.

#### **Nisqually Tribe**

Planning team members met with the Nisqually Tribal Council and Historical Committee. The tribe views the park as a spiritual place and conducts ceremonies there during certain times of the year. Tribal members expressed concern about whether tribal interests would be seriously considered in the planning process. Three key concerns were (a) that the tribe have access to the park without having to use shuttles, (b) that the tribe (primarily the historical committee) be involved in planning any new interpretive centers so that the Nisqually voice and history could be included from their perspective, and (c) that the draft should specifically refer to the Nisqually memorandum of understanding, the first of its kind for the park and tribe, and that the draft also should mention the treaties and the significance of the mountain from the Nisqually perspective.

The tribal members expressed support for the major parts of the plan. They requested that the park (a) provide funds for a tribal monitor for construction work, (b) fund a project to document and evaluate the cultural resources from the native point of view, involving elders and

spiritual people, (c) develop a clear understanding of the significance of cultural resources, and (d) display a commitment to respect and support the tribe's cultural survival.

### **Puyallup Tribe**

Planning team members met with representatives of the Puyallup Tribe to hear their concerns about the draft plan and other park issues. Tribal representatives asked if the planning team had documented the historical use of park by the Puyallup tribe. Planning team members responded that the National Park Service is committed to developing a good working relationship with the tribe to document tribal use of the park. The tribe might become more engaged with the park by helping train park employees and providing programs for park visitors.

A major concern of the tribe is the preservation of the wildlife and their habitat, particularly the critical winter range for deer and elk.

Tribal representatives also questioned the rationale for the Carbon River Road and the proposed boundary expansion. It was noted that the washouts are not safe and that the last repair was costly and lasted only a month. The response was that the proposed boundary expansion is to provide a place for recreational facilities when vehicular access to the Ipsut Creek area can no longer be maintained within the active floodplain.

Planning team members explained the carrying capacity framework model, including the need for standards and indicators for each zone to monitor use, stressed the agency's new policies toward resource preservation over visitor use, and outlined the park's five-year goal to have all the indicators determined.

The tribal representatives were asked if the tribe had any sensitive areas or special use areas inside the park. One member responded that he did not know of any specific sites and added

that, for the Puyallup, it may be a case of regaining lost opportunities.

Other topics discussed at the meeting included elk management, bull trout, the tribe's involvement with wildlife studies, and the management and ownership of lands adjacent to the park.

### **Cowlitz Tribe**

The planning team shared the basic principles of the draft plan with the tribal chairman of the Cowlitz Tribe, stressing hydrology and the need to improve NPS information and education efforts. The tribal chairman noted that the tribe's primary concern is ecological, that all of the Earth Mother is sacred. He added that the tribe's watershed lands need to stay in as near an aboriginal condition as possible. He also expressed concern about the preservation of cultural sites and interests.

Mount Rainier is important to the tribe and is included in various versions of their creation mythology.

### **Tacoma Chapter of the Mountaineers**

About 90 members of the Tacoma Chapter of the Mountaineers met with planning team representatives to discuss the plan. Although they generally expressed support for the major elements of the plan, they said they were concerned about the details of the shuttles systems. Some people asked why climbers and backpackers had been "singled out" as mandatory shuttle riders during peak use times. It was noted that the schedules of climbers and backpackers can vary greatly because of unforeseen circumstances, so that meeting shuttle schedules could be difficult. Some people said they thought it would be better to shuttle day-users.

Members of the Mountaineers also suggested that a "hospitality" room be made available with lockers for visitors to use while waiting for shuttles. A question was asked about the

possibility of using incentives and disincentives to encourage shuttle use during peak times. It was suggested that the current van fee policy (\$5 per person in vans that hold more than 7 passengers; \$10 for smaller family size vehicles) be changed to encourage multipassenger van pool use.

Members also suggested that shuttles be scheduled to go around the mountain to accommodate cross-park hiking or climbing traverses, that shuttles be made available in winter that hikers or climbers could voluntarily use to get to Paradise, and that the National Park Service explore using the Buck Creek area to stage shuttles for both Sunrise and Crystal Mountain Resort (although some security concerns about the staging area were mentioned).

Some Mountaineers members said they supported the proposed boundary adjustment for the Carbon River/Copley Lake area. Some suggested that replacing the Copley Lake bridge and the proposed Foothills Trail expansion would help to reduce pressure on the park by redistributing visitors, as would the possible recreational development of Pierce County's Fairfax section. Members also asked if the Mountaineers' Irish Cabin property would be purchased and wanted to know about Plum Creek's logging activities in the area.

Some asked about the current road corridor "visioning" process on the major access roads (State Routes 410, 7, and 706 and route 161) and the welcome center concept. People expressed concern that the gateway communities such as Crystal Mountain Resort, and Mount Rainier Resort at Park Junction, might overmarket the park and contribute to more negative impacts. Some asked how the general public (in addition to corridor stakeholders) could get involved and educated about the corridor planning process.

## U.S. Forest Service

Planning team members met with representatives of Mount Baker-Snoqualmie, Gifford Pinchot, Wenatchee, and Olympic National Forests to discuss the draft plan. The main issues discussed were the proposed Carbon River boundary adjustment, the proposed Crystal Mountain master development plan, Rainier Timber Co., LLC / Plum Creek lands west of park, and possible land exchanges or purchases.

The Mount Baker-Snoqualmie staff indicated that the forest will pursue purchasing land between the park and the Clearwater Wilderness Area that is now owned by Plum Creek. The staff suggested that section 33, just north of the Carbon River entrance, could be incorporated into the park's boundary adjustment. They also mentioned that an access easement agreement could be written for the roads and a new replacement bridge (scheduled to get underway next summer). They said that the Forest Service will support either NPS acquisition or management of Forest Service lands within the boundary adjustment (with an access agreement) or a boundary adjustment that would allow the Forest Service to retain ownership of the land and work jointly with the Park Service to protect the corridor.

The park staff asked if enough visitors use the Copley Lake-Clearwater Wilderness area to support a shuttle staging out of the proposed Carbon River administrative/campground hub serving Ipsut Creek and Mowich Lake. The forest staff replied that the current use levels would not support a shuttle but that use could increase in the future.

Both agencies agreed that there are opportunities to work together in the Crystal Mountain area to complement mission goals. Concern was expressed that zoning the area adjacent to the Crystal Mountain special use permit area as pristine could result in problems, and it was suggested that this area instead be changed to a primitive prescriptive management zone. This

zoning might be more compatible with resource conditions and visitor expectations in an area adjacent to lands in the Crystal Mountain area managed by the Forest Service. A land exchange also might be possible, exchanging NPS lands in the Crystal Mountain area for Forest Service lands within the proposed Carbon River area boundary adjustment.

The park's visitor carrying capacity was discussed, as were potential conflicts with adjacent Forest Service wilderness areas. The park staff and forest staff agreed to collaborate in developing and monitoring indicators and standards to ensure resource protection and high quality visitor experiences.

Also discussed were the ownership of land adjacent to and west of the park and the possible future development of these lands, support of the Outdoor Recreation Information Center in Seattle, and pressure to provide year-round use of the Skate Creek Road south of the park.

### **Pierce County**

In meeting with Pierce County, the park superintendent described the draft plan. One council member asked for further explanation of the need to replace the Henry M. Jackson visitor center. The superintendent gave a brief summary of the facility's history and discussed the cost of replacement versus the cost to bring the facility up to code and to meet the accessibility requirements of the Americans with Disabilities Act. He also discussed operations and maintenance costs and the failing roof snow-melt system.

The roadway corridors leading to the park also were discussed. The superintendent noted the need to work closely with Pierce County and other counties that are closely linked to the park regarding the road corridors leading to the park. He explained that Mount Rainier's transportation strategy is twofold: (a) explore alternative opportunities for a multimodal shuttle system in partnership with other agencies and interests and

(b) explore opportunities to enhance existing or create new visitor opportunities in the larger region to disperse visitation and avoid congestion in any one area.

Pierce County Council members expressed their love for Mount Rainier National Park, confirmed that it is very important to the county and the region, and expressed their appreciation that the superintendent shares with them the future management direction for the park.

### **LETTERS AND E-MAIL COMMENTS**

A total of 143 separate written comments were received during the comment period, including letters, comment forms that were filled out and either mailed or given to park staff, and e-mail comments. (This does not include individuals who wrote more than one letter.) Of the 143 items, 27 were from agencies and organizations: 3 federal agencies, 2 tribes, 3 state agencies, 1 regional government, 16 nongovernmental organizations, and 2 businesses. The other 116 written comments were from individuals.

Most individual comments came from Washington, with the Puget Sound area, including Seattle-Tacoma, accounting for the largest number of responses. Comments were received from individuals in two other states, Oregon and West Virginia. The written comments from individuals included a much larger range of opinions than the oral comments. Most of the commenters did not say which alternative they favored. Of those who did, 17 people and organizations favored the preferred alternative, 8 favored alternative 3, and three favored alternative 1. Thirty individuals and organizations supported the preferred alternative with changes.

Table 16 summarizes how individuals and organizations commented on several topics and issues. The table indicates who and how many supported a particular issue/topic in the preferred alternative in the draft document, who was opposed, and who suggested variations of

actions in the preferred alternative (labeled as “other” in the table heading). The topic most commonly mentioned was establishing a shuttle system in the park. The following other topics and issues were commonly mentioned in comments by individuals and organizations:

- providing shuttles on the Westside Road
- closing the Carbon River road to vehicles
- replacing the Henry M. Jackson visitor center
- proposed Carbon River boundary adjustment
- changes to the Mowich Lake area
- visitor carrying capacity

There was general support for the concept of operating shuttles to reduce congested roads and parking areas. Commenters said shuttles would improve access, reduce environmental impacts, and improve the quality of the visitor experience. However, many commenters said they wanted more details on the shuttles, how they would operate, where they would go and how often, and who would be required to use them. Many said they were concerned about the impact the shuttles would have on their experience in the park.

Climbers and backpackers in particular said they thought they had been unfairly “singled out,” and many of them objected to the idea that climbers or hikers would be required to take shuttles. They said the shuttles might not be able to accommodate their gear, and they expressed concern about early starts, climbers returning late, and problems of safety for returning climbers. They also asked questions about obtaining permits and where climbers coming from the east side of the park could park when required to ride the shuttle.

Some people favored requiring that day visitors use the shuttles; others said using the shuttles

should be voluntary. Many commenters had suggestions about the operation of the shuttles; some suggested offering incentives to use shuttles, and some made suggestions about when and where the shuttles should operate, where staging areas should be located, and the use of a reservation system. A few individuals were opposed to the shuttles because of the high cost or making them mandatory, which they said would adversely affect visitor experiences.

Commenters were about evenly divided regarding providing shuttles on the Westside Road. Those who supported this action said they thought it would allow more day hiking and would let families use a part of the park they cannot enjoy now. They said it would disperse visitors and relieve pressure at other developed areas.

People who opposed having shuttles on the Westside Road said they were concerned that the increased use of this area would result in more resource damage in this part of the park and said that the shuttles would adversely affect the wilderness experience. Some said they were concerned that there would be a high cost to maintain the road and operate the shuttles and that the road would be likely to wash out again. Some commenters said they wanted the road to be made accessible for personal vehicles. One nonprofit group called for studies to evaluate the impacts on wildlife before the road could be opened to shuttles.

People who commented also were about evenly divided on the subject of eventually closing the Carbon River Road to personal vehicles. Those who supported the closing recognized that the river eventually would reclaim the roadbed, and they said they favored being able to walk through the rainforest. Some said they thought too much had been spent on maintaining the road and that closing the road would positively affect wildlife.

Those who opposed closing the road noted that many people, including families and people with

disabilities, no longer could have the special experience of seeing the Carbon Glacier — this action would make one of the park’s most popular trails inaccessible to 95% of park visitors, according to some who opposed it. Closing the road would eliminate a day use destination, which helps disperse use in the park. Many commenters said the Park Service has not fully investigated possible options to repair the road or find an alternative route around the washout. Some argued that at a minimum shuttles should be provided if the road was to be closed to personal vehicles.

Most commenters also supported the Carbon River boundary adjustment, seeing that it would help preserve resources and provide additional recreational opportunities. A few individuals said they were opposed to the acquisition of more land by the National Park Service, but many individuals and organizations said they wanted the Park Service to expand the boundary much farther, providing greater protection for the ecosystem.

Most people and groups commenting on the changes proposed for the Mowich Lake area supported these actions. Those favoring the changes said that providing a shuttle, closing the end of the road, and reconfiguring the campground would protect the environment and improve the quality of the visitor experience. A few people questioned the expense of operating a shuttle, said that the road should be paved, or opposed closing part of the road to vehicles.

Many commenters supported the need to address the park’s visitor carrying capacity, but concerns were expressed about the details and how this action would be implemented. Some people requested more information about how the carrying capacity would be determined, how the information would be used, and how the public could get involved in determining the carrying capacities. People asked what indicators and standards would be selected.

TABLE 16: WRITTEN PUBLIC PREFERENCES ON SELECTED ISSUES AND TOPICS

Topic/Issue	Support	Oppose	Other
<b>Eliminating overflow parking</b>	Sierra Club, Cascade Chapter Washington Trails Association Northwest Ecosystem Alliance 3 individuals	2 individuals	None
<b>Providing shuttles</b>	Washington Interagency Committee on Outdoor Recr. Sierra Club, Cascade Chapter Northwest Ecosystem Alliance 31 individuals	The Mountaineers, Climbing Committee 4 individuals	Bluewater Network Washington Trails Assoc. The Mountaineers Mount Rainier National Park Associates American Alpine Club 26 individuals
<b>Shuttles on Westside Road</b>	Washington Native Plant Soc., South Sound Chapter The Mountaineers 17 individuals	Washington Interagency Comm. on Outdoor Recr. Sierra Club, Cascade Chapter. N. Cascades Conserv. Council Nat. Parks Conserv. Asso. 16 individuals	Tahoma Audubon Society 8 individuals

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<b>Topic/Issue</b>	<b>Support</b>	<b>Oppose</b>	<b>Other</b>
<b>Closing Carbon River Road to vehicles</b>	Washington Interagency Committee on Outdoor Recreation Sierra Club, Cascade Chapter 14 individuals	Washington Native Plant Soc., South Sound Chapter The Mountaineers 15 individuals	3 individuals
<b>Mowich Lake proposal re shuttles, road changes, campground</b>	Tahoma Audubon Society Northwest Ecosystem Alliance Mount Rainier Nat. Pk. Associates National Parks Conserv. Asso. 12 individuals	4 individuals	Washington Interagency Comm. on Outdoor Recr. 6 individuals
<b>Plowing State Route 410</b>	Wapiti Woolies 4 individuals	Crystal Conserv. Coalition 6 individuals	2 individuals
<b>Limiting stock use</b>	Northwest Ecosystem Alliance 5 individuals	Enumclaw Trail Riders 1 individual	Tacoma Wheelmen 2 individuals
<b>Prohibiting snowmobiles</b>	Bluewater Network North Cascades Conserv. Council The Mountaineers American Alpine Club Nat. Parks Conserv. Association 9 individuals	1 individual	None
<b>Replacing Jackson visitor center</b>	Sierra Club, Cascade Chapter N. Cascades Conservation Council The Mountaineers Mount Rainier Nat. Park Asso. 23 individuals	9 individuals	Tahoma Audubon Society Nat. Parks Conservation Association 5 individuals
<b>Changes at Sunrise</b>	1 individual	None	None
<b>Carbon River boundary adjustment</b>	Washington Interagency Comm. on Outdoor Recreation N. Cascades Conservation Council Northwest Ecosystem Alliance Nat. Parks Conserv. Association 12 individuals	3 individuals	Washington Native Plant Soc., South Sound Chapter Sierra Club, Cascade Chapt. Mount Rainier Nat. Pk Asso. 6 individuals

Commenters often expressed their opinions on operational matters such as making changes to group sizes, and some asked what actions might be taken at specific areas like Tipsoo Lake. Some were concerned about limits that might be imposed on their access to various areas. Some people said the plan does not adequately address day use in heavily used areas, saying that day users need to be managed like climbers and backpackers, particularly in sensitive areas like alpine and subalpine areas. Several people said they were concerned about solitude in the wilderness zones and argued that social interactions should not be a deciding factor on whether or not to limit use in a wilderness zone.

On other issues, most of those who commented on overflow parking favored eliminating it. Most people who commented on snowmobiling and livestock use supported prohibiting snowmobiling and limiting livestock use to two trails. Those who commented on plowing State Route 410 were divided; slightly more people opposed plowing than favored it.

Comment letters dealt with a wide range of other issues and topics, including park visitation levels, air quality, the need to address ecosystems beyond the park's boundary, and a variety of operational topics such as fees, guiding versus private climbing party allocations, and providing more backcountry rangers. Comments also were received on the management of fish stocks and other wildlife, zoning in the wilderness area, consultation with Native American tribes, and moving concessioner commercial developments outside the park.

People also commented about the use of bicycles, the proposed welcome centers, the use of the snowplay area, and developments occurring outside of the park such as the Crystal Mountain expansion. Other topics mentioned were the proposed changes in traffic flow to Paradise and the use of the Longmire campground. People commented about visitor programs and interpretation (for example, the need to educate

visitors about geohazards) and general planning concerns such as the high cost of the preferred alternative and how it would be funded.

### **MAJOR CHANGES MADE IN THE FINAL PLAN**

A number of changes from the draft plan were made on the basis of the comments the planning team received. The major changes that were made during the preparation of this final plan are listed below. The list does not include all the changes that were made to clarify points, provide additional rationale for decisions, or correct minor errors or omissions. Unless otherwise stated, all the changes below apply to the preferred alternative.

- The nonwilderness primitive zone has been changed to provide for trails.
- In the "Direction for the Plan" section, new text has been added on Native Americans, the long-term ecosystem monitoring network, and cooperation with timber companies and other landowners.
- Because it is premature to specify who, if anybody, would be required to use the shuttles, the requirement that climbers and backpackers take shuttles has been dropped from the preferred alternative and alternative 3. Shuttles would be phased in, with public input. A transportation implementation plan would be prepared to determine the design and operation of shuttles in the park, including the use of incentives.
- To improve the quality of the visitor experience and to enable people to visit who otherwise could not, the preferred alternative has been changed to include the provision of a winter shuttle to Paradise.
- The Carbon River road would be kept open for personal vehicles as long as possible. A shuttle also would be made available.

Although there would be no restrictions on personal vehicles, high-clearance vehicles would be recommended.

- The direction of traffic on the Paradise Valley Road would be reversed on a trial basis. The western half of the Paradise loop would continue to be open to two-way traffic. The results of the test would be evaluated to determine if this change should be made permanent.
- An area for stock staging would be designated in the Ohanapecosh area so that stock groups could access the Laughingwater Trail.
- A change has been made in the proposal for a full-service Nisqually visitor center on State Route 706. Instead, it would be a welcome center and theater. It would be located in cooperation with partners at a site to be determined.
- The Carbon River boundary adjustment has been modified to better protect the river corridor and better define the boundary.
- The zoning of the Longmire campground has been revised to provide for picnicking in the summer.
- The initial costs for all the alternatives have been changed from net to gross costs, which incorporates costs for construction management and contingencies. Although the gross costs are higher than the net costs in the draft document, it is important to note that the cost figures are included for comparative purposes only, and the relative difference between the alternatives has not changed substantially.
- The environmentally preferred alternative has been identified at the end of the “Alternatives” chapter.

- In compliance with a recently adopted NPS management policy, a new section on impairment has been added to the end of the “Environmental Consequences” chapter.

## RESPONSES TO SUMMARIZED COMMENTS

### Introduction

This section provides responses to substantive oral and written comments from agencies, organizations, tribes, and individuals. Each commenter was assigned an alphanumeric code. The letter within the code describes the affiliation of the commenter (agency, organization, or individual), and the number, assigned sequentially, uniquely identifies the commenter. Table 17 lists each commenter and the code for that commenter.

Written comments varied in length from less than a page to more than 30 pages and ranged in coverage from a single item to many subjects. Many commenters identified similar concerns. Therefore, to reduce repetition, the comments and responses are grouped by topic. Similar comments within each topic are summarized, with an identification of their sources, and then a response to each is given.

As noted at the beginning of this chapter, responses are provided only to substantive comments. Many comments the planning team received (opinions in favor of or against an alternative) do not meet the criteria of substantive comments, or were outside the scope of the *General Management Plan*. Although the National Park Service values this input, we have not responded to such comments.

Several people pointed out errors in the text. Changes were made to correct errors where appropriate; these changes are not noted in the following the summarized comments and responses.

**TABLE 17: IDENTIFICATION OF COMMENTERS**

Commenter	Commenter Code
<b>FEDERAL AGENCIES</b>	
U.S. Forest Service: Okanogan and Wenatchee National Forests	A 1
Environmental Protection Agency	A 2
U.S. Fish and Wildlife Service	A 3
<b>STATE OF WASHINGTON AGENCIES</b>	
Interagency Committee on Outdoor Recreation	B 1
Department of Transportation	B 2
Office of Archeology and Historic Preserv.	B 3
<b>LOCAL AND REGIONAL GOVERNMENTS</b>	
City of Enumclaw	C 1
<b>NATIVE AMERICAN TRIBES</b>	
Muckleshoot	D 1
Puyallup	D 2
<b>BUSINESSES</b>	
Wapati Woolies	E 1
Glacier Water Company, LLC	E 2

Commenter	Commenter Code
<b>NONGOVERNMENTAL ORGANIZATIONS</b>	
Enumclaw Trail Riders	F 1
Tacoma Wheelmen	F 2
Tahoma Audubon Society	F 3
Bluewater Network	F 4
Washington Native Plant Society, South Sound Chapter	F 5
Sierra Club, Cascade Chapter	F 6
Washington Trails Association	F 7
Crystal Conservation Coalition	F 8
North Cascades Conservation Council	F 9
Friend of the Carbon Canyon	F 10
Northwest Ecosystem Alliance	F 11
The Mountaineers	F 12
The Mountaineers, Climbing Committee	F 13
Mount Rainier National Park Associates	F 14
The American Alpine Club	F 15
National Parks Conservation Association	F 16

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Commenter	Commenter Code
<b>CITIZENS</b>	
Aegerter, Bob	G 89
Aiken, Jeffrey L.	G 93
Alleman, Virginia and Gerald Howe	G100
Allen, William F., Jr.	G 9
Anderson, Valerie	G106
Backus, Jo	G 95
Barger, Robert M.	G 52
Bartholomot, Henri D.	G101
Bee, Cindy	G 99
Biek, David	G 27
Blanchard, Bev	G 26
Boone, James L.	G 10
Bourne, Andy	G 44
Breit, Thomas	G 43
Brooks, R. J.	G 57
Brown, Steve	G103
Calderon, Eric	G110
Campbell, Loren	G 41
Coulbourn, George I.	G 29
Crandell, Perry	G 86
Cubert, Betty and Pauline Kirkman	G 68

Commenter	Commenter Code
Dacunto, Larry and Emilie	G 7
Degerman, Eric	G 92
Dehline, Steve	G105
Denton, Steven	G 73
Dobbs, Carolyn	G 17
Dreimiller, Joe	G 31
Dyer, Polly and John A.	G102
Edwards, John S.	G 5
Emerson, Earl	G 61
Engel, Donald	G 37
Engle, Helen	G 32
Fabiani, Carl and Dinni	G 82
Feller, Stefan	G 97
First, Colleen	G 67
Fluegel, Marilyn and Keith	G 48
Friend, J. L.	G113
Fries, Mary A.	G 90
Gardner, David	G109
Gatchel, Clay and Dixie	G104
Gillespie, Bruce	G108
Hansen, Judy	G 49
Hansen, Raymond	G 45

Summary of Public Comments on the Draft Plan, with Responses

Commenter	Commenter Code
Harkness, Melissa	G 18
Harnish, Jerry	G107
Helf, Susan	G 24
Henderson, Edward M., Jr.	G 88
Hentges, Robert J.	G 33
Holscher, Gary	G 77
Horiskey, Joe and Majorie	G 63
Jacobson, Lawrence M.	G 2
Johnson, Aaron	G111
Jones, Michelle	G 21
Keesling, Maxine	G 30
Kemp, John	G 55
Kohl, John M. and Karen H.	G 20
Komarnitsky, Betsy	G 47
Koury, Al	G 85
Lally, Mark and Lisa	G 13
LeFrancois, Gil	G 23
Leicester, John R.	G 91
Leskovar, Geraldine and John	G 98
Ludtenburg, Lynn	G 59
Lukins, Richard	G 1
Mann, Amy	G 15

Commenter	Commenter Code
McIntyre, Bob Jr.	G 80
McNulty, Tim	G 84
Meassick, Eva	G 60
Mendenhall, John C.	G112
Miles, Frank	G 50
Morrison, Chuck	G 87
Myers, Stuart	G 66
Nelson, Eric H. and Judy A.	G 65
O'Conner, K.	G 14
Parker, Jerry	G 12
Parfani, Flash	G 75
Payne, Randell D.	G 72
Perez, Jason	G 19
Perez, Jason	G 22
Peterson, Wilma	G 64
Pirie, Ken	G 46
Pratt, Clar	G 78
Quinn, Kirsten A.	G 51
Rasmussen, Al	G 16
Ratliff, Ginny	G 40
Romer, Leslie H.	G 76
Russell, Tim	G 83

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<b>Commenter</b>	<b>Commenter Code</b>
Sando, David R.	G 62
Sanford, Larry	G 34
Scarborough, James	G 36
Schaufler, Paul G.	G 3
Schuller, Josef and Ruby	G 79
Shafer, David	G 11
Sherwood, Dennis	G 35
Short, Steven	G 42
Simonson, Eric	G 114
Smith, Andy	G 96
Smith, Pamela	G 71
Spring, Ira	G 81
Squires, John	G 8
Stephens, Roger D.	G 4
Strickland, Leslie	G 39

<b>Commenter</b>	<b>Commenter Code</b>
Sullivan, Sean	G 94
Sulzbacher, Stephen	G 6
Titland, John A.	G 74
Ulrich, Phil	G 28
Walker, Scott G.	G 25
Warfield, Bob	G 69
Weatherly, Eugene	G 116
Wilcox, John E.	G 58
Wilson, Ed	G 115
Winn, Norman I.	G 93
Woodbury, Scott	G 53
Worden, Brenda	G 70
Yielding, James H.	G 38
Yuaker, Barbara	G 54

## COMMENTS AND RESPONSES

### Alternatives and Supporting Information

**Comment:** The plan fails to consider a full range of alternatives. (Sources: F3, F14, G74, G75, G78, G107)

**Response:** The National Park Service conducted a series of public scoping meetings to gather public input and develop a range of alternatives. The range of alternatives in the *General Management Plan* addresses the issues gathered through the scoping process and complies with the legal mandates and policies of the National Park Service.

**Comment:** The plan does not provide enough detail and defers future decisions to park management. (Sources: D2, G75, G78)

**Response:** A plan is developed to ensure that each NPS unit has a clearly defined direction for managing resources and visitor use. General management plans take a long-term view, establishing the resource conditions and visitor experience opportunities that should be achieved and maintained over time. Following the *General Management Plan*, a series of implementation plans (such as plans for transportation and resource management) will be prepared. These plans will describe how these resource conditions and visitor experiences will be achieved. The implementation plans, which will include greater detail on how resources conditions and visitor experiences will be managed, will be prepared in compliance with the National Environmental Policy Act, which includes the opportunity for public review and comment.

**Comment:** The plan should include a definition of “appropriate recreation” for Mount Rainier National Park. (Source: F4)

**Response:** The *General Management Plan* addresses what is “appropriate recreation” in the management zones established in the alterna-

tives. The “Purpose of and Need for the Action” chapter of the *General Management Plan* includes text that defines appropriate visitor access and enjoyment. The laws, regulations, and policies that guide the management of units in the national park system ensure that appropriate levels and kinds of recreation occur within Mount Rainier National Park.

**Comment:** The *General Management Plan* states that the National Park Service will “promote and foster partnerships with individuals and groups.” The plan should include guidelines for when and how partnership agreements would be used. (Source: F4)

**Response:** A new section has been added to the “Direction for the Plan” section titled “Relations with Private and Public Organizations, Owners of Adjacent Land, and Governmental Agencies.” That section addresses partnerships. In addition, *NPS Management Policies* (2001b, 1.9) provide guidance for entering into partnership agreements.

**Comment:** Commenters gave recommendations and asked questions relating to the management zones used for specific areas of the park, such as the Summerland Trail, Cowlitz Divide Trail, and Lake James. (Sources: A1, B1, F14, G74, G75, G78)

**Response:** The zones in the *General Management Plan* reflect the desired future conditions for these areas, not necessarily the current use levels of the area. The zones also reflect the reality that certain popular areas receive high use levels. If the zones were to be changed, many people would be displaced to other parts of the park. The National Park Service believes that the zones applied to these areas in the draft plan are appropriate.

**Comment:** Why does table 2 not show the Chinook Pass facilities? (Source: G52)

**Response:** Chinook Pass facilities (parking, restrooms, overlook, etc.) are not within the

boundary of Mount Rainier National Park. They are on federal lands managed by the U.S. Forest Service.

**Comment:** The plans should address staffing needs to implement the alternatives. (Source: G4, G75, G78)

**Response:** The plan does address staffing needs for implementing alternatives 2 and 3 in the “Costs and Implementation” section of the document.

### Boundary Adjustments

**Comment:** The National Park Service should look at expanding the boundary in other areas of the park, including Nisqually River Valley, White River, and Ohanapecoh. (Sources: G75, G84, G104, G107)

**Response:** As stated in the “Direction for the Plan” section titled “Relations with Private and Public Organizations, Owners of Adjacent Land, and Governmental Agencies,” the National Park Service feels it can be more effective working with adjacent managers to find common practices that protect the park and ecosystem values than just expanding the park boundary. The Park Service studied other areas adjacent to the park and determined that only the proposed Carbon River addition meets the NPS criteria for boundary adjustments.

**Comment:** The Carbon River boundary adjustment should be larger than what is proposed in the draft plan. Commenters suggested specific areas that should be incorporated into the park, such as the lands between the park and the Clearwater Wilderness Area, the Chenuis Creek drainage, and the lands south of the proposed boundary to include the road corridor. (Sources F2, F3, F5, F6, F10, F14, G9, G35, G36, G57, G72, G74, G75, G78, G89, G105)

**Response:** The NPS criteria for recommending boundary adjustments are quite strict. For

example, there must be no alternatives to direct NPS management. The National Park Service believes there are such alternatives (such as encouraging owners of adjacent property to adopt timber practices that protect resource values), and that proposing a larger boundary adjustment is not feasible.

**Comment:** The expansion of the park in the Carbon River area will have an adverse impact on elk hunters that currently use this area, because hunting is not allowed in the park. (Source: G78)

**Response:** The text in the “Environmental Consequences” chapter has been revised to address this potential impact.

**Comment:** The proposed boundary adjustment in Carbon River area should be reevaluated. The boundary should be redrawn to include the entire riverbed. (Source: G75)

**Response:** We agree. The National Park Service has redrawn the boundary adjustment area to follow the Carbon River drainage. The boundary adjustment map has been revised.

**Comment:** Clarify the process used to decide on the proposed boundary adjustment. (Source: D2)

**Response:** The rationale for proposing the boundary adjustment in the Carbon River area is discussed in appendix E of the document. The process used for evaluating a park’s boundary is guided by *NPS Management Policies 2001* (NPS 2001b).

### Carbon River Road

**Comment:** Carbon River Road gives people a unique opportunity for access to the Carbon Glacier. The road could be maintained through the use of correct road-building techniques, including armoring, constructing dikes, or building the road on piers. Another alternative would be to route the road to the north side of the river

to an existing road. (Sources: F12, G29, G34, G55, G58, G64, G75, G78, G93, G105)

**Response:** The National Park Service is committed to keeping the road open to the public as long as possible. The preferred alternative has been revised to include establishing a shuttle on this road and allowing private vehicles as long as possible. At some time the Park Service may recommend that the public traveling on the road use high-clearance vehicles. An evaluation of the Carbon River Road determined that it was not feasible to maintain the road in cost-effective manner because of the frequency and intensity of flooding. Further rerouting of the road in this area would be difficult because of the sensitivity of the resources in the area — designated wilderness, endangered species, old-growth forest, and aquatic riparian systems. Rerouting the road to an existing road on the north side of the Carbon River would require the replacement of a bridge (scheduled to get underway in the summer of 2001 according to Mount Baker-Snoqualmie National Forest representatives). However, the rerouting would not give visitors direct access to the Carbon Glacier.

**Comment:** The preferred alternative should consider a shuttle on the Carbon River Road, which would continue to allow visitors access to the Carbon River glacier. (Source: G52, G75)

**Response:** The preferred alternative has been revised to include shuttle service on the Carbon River Road.

### Carrying Capacity

**Comment:** The plan lacks adequate details on the park's carrying capacity, such as prioritizing areas for implementation, identifying indicators and standards, and stating how the National Park Service will involve the public in developing indicators and standards. (Sources: B1, D2, F5, F14, F16, G74, G75, G78, G84)

**Response:** The *General Management Plan* has established the carrying capacity framework and qualitatively evaluated carrying capacity, which is an appropriate level of detail for a general management plan, according to *Management Policies* 2001 (NPS 2001b). The National Park Service will develop indicators and standards for establishing carrying capacities for the park, and as part of this effort will seek input from the public.

**Comment:** If visitor experience is to be used as carrying capacity indicator, the *General Management Plan* needs to explain how data will be gathered and analyzed and how data will be used to set carrying capacity. (Sources: F14, G74, G75, G96)

**Response:** As discussed above, indicators and standards for implementing the park's visitor carrying capacity will be developed in the future. Data collected for carrying capacity indicators will be scientifically sound, meaning indicators will be objective, reliable, repeatable, and sensitive enough to detect change. Appendix D contains examples of possible indicators and standards that may be used at the park.

**Comment:** The *General Management Plan* regulates campers and climbers, but it does an inadequate job of addressing heavy day use in high impact areas. The plan needs to establish quotas and limits for day users, particularly in subalpine and alpine areas. (Source: G84)

**Response:** The plan includes a carrying capacity framework that sets the basis for managing all visitors, including day users, in the park. Both day and overnight use will be managed through the establishment of indicators and standards (see pages 71–72). Through monitoring, the National Park Service will determine when areas of the park are being degraded by visitor use. When areas are being degraded, management actions such as education and signs or, as a last resort, use limits, will be implemented.

**Comment:** Please clarify how resource indicators and standards in the park will relate to indicators and standards being used outside the park. (Source: D2)

**Response:** As the National Park Service moves forward with developing indicators and standards for the park, information will be obtained from other land managing agencies in the region, such as the U.S. Forest Service. This information will help NPS employees develop indicators and standards that are consistent within the region. However, it also should be pointed out that the standards that apply to national parks may not be the same as those used by other land managing agencies.

### **Cultural Resources**

**Comment:** The National Historic Landmark District map in the draft document is incorrect; it shows structures that no longer exist. (Source: G75)

**Response:** You are correct. The map has been revised.

**Comment:** Please clarify definitions for terms such as cultural landscapes and ethnographic landscapes. (Source: D2)

**Response:** The National Park Service has a standard definition of a cultural landscape; it is found Director's Order 28 (NPS 1997a): "A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values." There are four general kinds of cultural landscapes: historic site; historic designed landscape; historic vernacular landscape; and ethnographic landscape. The last is defined as "areas containing a variety of natural and cultural resources that associated people define as heritage resources, including plant and animal communities, geographic features, and

structures, each with their own special local names,"

### **Ecosystem Management**

**Comment:** Mount Rainier National Park should work immediately with other federal, state, and tribal partners to protect resources on an ecosystemwide approach. Issues such as protecting wildlife habitat, air quality, viewsheds, night sky, and watershed could be dealt with on a regional scale, not just within the park boundary. (Sources: B3, D2, F6, F9, G75, G76)

**Response:** As discussed in the draft plan (pages 15–16), Mount Rainier National Park staff are working with owners of adjacent property and nearby land management agencies and will continue to build on these relationships. The "Direction for the Plan" section has been revised to include a discussion on working with land management agencies and owners of adjacent property. An example of NPS efforts to work with partners is our participation in a multi-agency effort focusing on the forest ecosystem habitat for the northern spotted owl. This effort includes several federal land management and regulatory agencies and the state of Washington.

### **Environmental Consequences**

**Comment:** References to timber harvest, logging, and vegetation management adjacent to the park are consistently negative. Admittedly, some activities degrade environmental conditions; however, many others, in particular those implemented under the Northwest Forest Plan, actually produce long-term environmental benefits. (Source: A1)

**Response:** We agree. The discussion of timber logging impacts in the "Environmental Consequences" chapter of the document has been revised.

**Comment:** The plan does not adequately address visual and visitor use impacts associated with development near the park boundary, such as the expansion of the adjacent Crystal Mountain ski area. (Sources: F8, G75, G100)

**Response:** The “Environmental Consequences” chapter has been revised to specifically note the visual impacts of the proposed Crystal Mountain expansion.

**Comment:** The plan does not adequately address direct and indirect impacts of increased traffic on deer and elk herds. (Source: D1)

**Response:** We have revised the “Environmental Consequences” chapter to address the potential for roadkills due to increased traffic.

### **Jackson Visitor Center**

**Comment:** Commenters discussed the design of the proposed replacement visitor center and recommended functions that should be included in the facility. (Source: F12, F75, G96)

**Response:** The proposed visitor center is in the design process. It will include features essential for a park visitor center, including an information desk, an exhibit area, an auditorium, restrooms, a dining facility, gift and book sales, and administrative functions. An environmental assessment will be prepared on the construction of the new visitor center, and the public will have an opportunity to review and comment on the assessment.

### **Longmire Campground**

**Comment:** The Longmire campground should be opened to the public for camping during the peak season. (Source: G45)

**Response:** Alternative 2 has been revised to permit the use of Longmire campground as a day use picnicking area. The area also would continue to be used as a Volunteers in Parks

camping area. However, the area is not suitable for public camping. Access to the Longmire area for camping is difficult because of road limitations, including the bridge over the Nisqually River. The area is in a geologic hazard area, and the Park Service is not encouraging increased overnight use.

### **Mowich Lake**

**Comment:** Some commenters supported and some opposed the modifications to the Mowich Lake area, including paving the road, parking arrangements, a picnic area, and a campground. (Sources: C1, F3, F6, F11, F12, F14, F16, G1, G3, G23, G34, G35, G36, G52, G56, G62, G72, G74, G75, G78, G81, B82, G84, G85, G89, G94, G105)

**Response:** The National Park Service believes that alternative 2 would protect the resources in this area and improve the visitor experience. After the *General Management Plan* is approved, the Park Service will work on a detailed site design and environmental assessment for the Mowich Lake area. At that time the public will have an opportunity to review the proposed modifications to the area and to comment on the plan.

**Comment:** The Park Service should pave the entire road to Mowich Lake to provide access to the lake for people with disabilities. (Source: G97)

**Response:** As noted previously, upon approval of the *General Management Plan* the National Park Service will proceed with site design planning for the Mowich Lake area. This process will determine how access might be provided in accordance with the Americans with Disabilities Act. It also should be noted that access to the lake for people with disabilities does not depend on whether or not the road is paved.

**Comment:** The preferred alternative indicates that two additional sites would be provided at

the Mowich Lake campground. The camping area does not have designated sites; thus, it is unclear how two sites would be added. (Source: G75)

**Response:** Alternative 2 has been revised to say that the Mowich Lake campground would have designated campsites. The exact number of sites would be determined in the design process for this area.

**Comment:** Table 2 indicates that Mowich Lake road would be zoned as “Visitor Facility”, and the Summer Management Zone map shows the road as “Roaded Multiuse.” Which is correct? (Source: G75)

**Response:** The Summer Management Zone map was incorrect. The map has been revised to show the road zoned as a “Visitor Facility,” except for the 0.5 mile from the new terminus to the lake, which is zoned “Roaded Multiuse.”

**Comment:** Mowich Lake road should be closed at the Paul Peak trailhead, and parking should be developed at this point. This would offer visitors access to a variety of areas and protect the wilderness resources in the area. (Sources B1, G56, G81)

**Response:** The preferred alternative pulls the road back 0.5 mile from the Mowich Lake to remove the resource threats discussed in the plan. Visitors still would have the opportunity to enjoy the lake. Moving the road back to Paul Peak would prevent most visitors from being able to enjoy Mowich Lake; therefore, that action would adversely impact many visitors’ park experience.

### Native Americans

**Comment:** The plan could adversely affect Native Americans, especially by affecting wildlife and plants that have cultural significance to the tribes. (Source: D1, D2)

**Response:** The National Park Service had government-to-government consultations on the plan with the Cowlitz, Muckleshoot, Nisqually, Puyallup, and Yakama Tribes. Based on these consultations the “Direction for the Plan” section and the “Affected Environment” chapter of the plan have been expanded to address concerns about impacts on Native Americans.

**Comment:** The National Park Service needs to establish better working relationships with the tribes. (Source: D1, D2)

**Response:** The National Park Service is currently working with five federally recognized tribes. Park staff met with all five tribes to seek their input on the *General Management Plan* and it has been revised on the basis of the input received from these consultations. The National Park Service intends to maintain active consultation with neighboring tribes in an effort to protect mutually important cultural and natural resources.

**Comment:** The National Park Service should consult with tribes about identifying and protecting natural and cultural resources such as cultural landscapes, wildlife habitat, watersheds, and archeological sites, and about the designation of wild and scenic rivers. (Source: D1, D2)

**Response:** The “Direction for the Plan” section of this document has been expanded to include a discussion on relationships with Native Americans. This section includes management strategies for improving relations with federally recognized tribes.

**Comment:** The plan focuses on traditional importance to Native Americans in the past tense. Many of these sites are still culturally important. (Source: D1, G75)

**Response:** After consultations with the tribes, the “Direction for the Plan” section and the “Affected Environment” chapter of the plan have been revised to recognize that sites in the

park have both historical and contemporary importance to Native Americans.

**Comment:** The park should involve the tribes and make use of their input about the information given to visitors on Native American cultural history. (Source: D2)

**Response:** The “Direction for the Plan” section of the document has been expanded to include a discussion on relationships with Native Americans. This section specifically includes a reference to seeking input from the tribes on the park’s interpretation program.

### Park Advisory Board

**Comment:** The National Park Service should create an advisory board to provide input into park management and help to disseminate information about the park. (Source: G80)

**Response:** The park staff currently consults with a large number of groups on a regular basis. These consultations have been very productive, and the park staff believes this allows the Park Service to hear a diversity of opinions. Furthermore, advisory groups must be chartered under and satisfy the provisions of the Federal Advisory Committee Act.

### Parking

**Comment:** If parking was permitted only at designated places, it would prevent people from parking or stopping along road shoulders. This would increase visitor frustration, prevent wildlife watching and stopping for scenic views, and prevent access to cross-country areas (Source: F14, G74, G75, G89)

**Response:** The plan would eliminate overflow parking at parking areas, which is a separate issue from parking along road shoulders in the rest of the park. Parking would be prohibited in all areas when there were public health and safety concerns or traffic congestion. Regarding

parking at pullouts along roads, as noted on page 28 of the draft plan, a study of the existing pullouts along park roads will be prepared after this plan is completed. This study will determine if the existing pullouts are adequate and in the proper places. Management action will be based on the results of this study.

### Plowing of State Routes 410 and 123

**Comment:** Comments were received both for and against the plowing of State Route 410 to provide winter access to the northeastern part of the park. (Sources G60, G75, G91, G104)

**Response:** In alternative 3, the National Park Service evaluated plowing State Route 410 to the White River entrance. The major concerns about plowing the road are operational and safety issues. Currently the park does not have the equipment or personnel based at the northeast entrance to keep the road open and safe in winter. If the road was plowed, the possibility of avalanches could raise concerns about visitor safety. In addition, as discussed in the section on the environmental consequences of alternative 3, the plowing would be likely to adversely affect the northern spotted owl, a federally listed threatened species.

**Comment:** Alternative 3 should provide more details on the funding and resources the National Park Service expects from the Washington Department of Transportation (WDOT) for plowing State Route 123. (Source: B2)

**Response:** The preferred alternative does not call for the plowing of State Route 123. Therefore, the Park Service is not seeking additional support from WDOT.

### Shuttle System

**Comment:** The plan lacks details on the operation of the shuttle system, including the locations of parking areas, hours of operations, and economic feasibility. (Sources: B2, F6, F9, F12,

F13, F14, F15, F16, G7, G14, G22, G24, G26, G30, G34, G35, G42, G43, G45, G52, G56, G58, G74, G75, G76, G77, G80, G81, G85, G88, G89, G93, G94, G96, G97, G98, G99, G101)

**Response:** We acknowledge that the draft plan lacks these details. The intent of a general management plan is to provide the overall goals and objectives for managing the park over the next 20 years. Additional planning will develop the means of implementing these goals and objectives. The National Park Service has determined that shuttles would be the most effective way of managing visitation to the park. Over the next few years we will develop a detailed transportation implementation plan that will focus on how a shuttle system can be managed effectively at Mount Rainier National Park.

**Comment:** The plan does not adequately assess the impacts of implementing the shuttle system, including establishing facilities outside the park. (Source: B1, B2, F16, G96)

**Response:** We acknowledge that the plan does not provide these types of details. As discussed above, the Park Service will develop an implementation plan that will establish the details of the shuttle system. That plan will be developed in compliance with the National Environmental Policy Act and will fully disclose the impacts of implementing the shuttle system. In this planning process, public input will be sought.

**Comment:** The plan fails to fully recognize the implications of requiring overnight backcountry users to ride the shuttles, including the handling of equipment and safety. Further, the Park Service should seek input from public on managing the shuttle system. (Sources: F6, F9, F12, F13, F15, G14, G22, G26, G34, G42, G43, G75, G77, G85, G88, G93, G94, G96, G97, G101)

**Response:** The National Park Service agrees that it would be premature at this point to establish a requirement that overnight backcountry users must ride the shuttles. The preferred alter-

native has been revised to eliminate this requirement. The detailed implementation plan for the shuttle system will determine how the system would operate in the most effective and efficient manner possible. Throughout this planning process, input from the public will be sought.

**Comment:** The plan is not clear on how a shuttle system would protect resources and improve the management of the backcountry. (Sources B1, G75)

**Response:** The shuttle system is a tool that could reduce parking issues in the frontcountry and move people throughout the park. Some of the positive benefits of a shuttle system were discussed on page 69 of the draft document. Specific resource benefits to Mount Rainier will be evaluated in more detail in the transportation implementation plan. With regard to managing the backcountry, once the shuttle system was running, it would need to be factored into management; the way different parts of the wilderness would be managed would be affected by trailhead parking, shuttles, zoning, and the carrying capacity. As noted on page 27 of the draft document, the park's wilderness management plan needs to be updated to address potential changes such as the shuttle system.

**Comment:** The National Park Service should implement incentives for people to use the shuttles or carpool to the park, such as reducing fees and incorporating interpretation into the shuttle ride. (Sources: F7, F15, G30, G56, G75, G107)

**Response:** We agree. The use of incentives is an excellent idea for encouraging the use of multi-passenger vehicles or using shuttles. The Park Service will explore incentives as it moves forward in more detailed transportation planning.

### Snowmobile Use

**Comment:** The Park Service should continue to allow snowmobile use at Cougar Rock campground, Westside Road, Mather Memorial Park-

way, and White River Road to White River campground. (Source: G8)

**Response:** As discussed in the “Purpose of and Need For the Action” chapter, the National Park Service is addressing snowmobile use at the national level. This effort is to ensure that use of snowmobiles complies with Executive Order 1989. An environmental assessment on snowmobile use in Mount Rainier National Park has been prepared and was released for public input in March 2001. The preferred alternative in that document calls for eliminating recreational snowmobile use in the park. This action would be taken to decrease winter use conflicts, reduce impacts on air and water quality, and decrease winter stress on wildlife. Few snowmobilers would be affected by this action, and other opportunities for snowmobiling exist in the region.

### Stock Use

**Comment:** Alternative 2 limits the use of stock animals to the Pacific Crest and Laughingwater Creek trails. However, the Laughingwater Creek trailhead lacks facilities for stock use and the necessary space for parking stock trailers. (Sources: F1, G52)

**Response:** We agree. The preferred alternative has been revised to include the development of a staging area for stock users in the Ohanapecosh area of the park. The staging area would provide adequate space to park stock trailers. The details of the development would be evaluated under a separate NEPA document.

### Sunrise Lodge

**Comment:** The plan should address the future of the Sunrise Lodge. The National Park Service should consider the possibility of preserving the lodge. (Source: B3)

**Response:** Redeveloping the Sunrise area was not included in *General Management Plan*,

because the National Park Service had previously prepared a *Development Concept Plan / Environmental Assessment* for this area. Public comment on that environmental assessment was sought and evaluated, and the finding of no significant impact approving the redevelopment of the Sunrise area was signed in November 1997. Thus, as noted on page 42, this action was considered a “given” for the *General Management Plan*.

**Comment:** The National Park Service should reduce the development in the Sunrise area, which would reduce environmental impacts and the cost of operating these facilities. (Source: F9, G104)

**Response:** As noted above, a *Development Concept Plan / Environmental Assessment* for the Sunrise area had already been prepared. Decisions about development in that area have been made and were considered as “givens” for the *General Management Plan*.

### Traffic Flow to Paradise

**Comment:** Alternative 2 proposes to reverse the flow of traffic on the Paradise Valley Road during summer. This change in traffic flow might create problems in safety and traffic circulation. (Sources: G31, G33)

**Response:** Alternative 2 has been revised to address these concerns. The Park Service would reroute traffic on a trial basis and then decide whether or not to modify traffic circulation at Paradise permanently.

### Visitation and Visitor Experience

**Comment:** Commenters indicated that table 12 in the draft, which shows visitor use statistics, does not support the trend of increasing visitor use discussed in the plan. (Sources: G8, G78, G107)

**Response:** Looking back over visitation since 1967, there has been an increase in visitation to the park. The sharp increases and decreases in visitation from year to year can be attributed partly to weather conditions. The heavy snow-pack in the winter of 1998–1999 delayed the opening of roads and trails in the park, resulting in a decrease in visitation. Likewise, the record rainfall in 1995–1996 closed the Carbon River area, delayed opening Mowich Lake, and closed portions of State Route 123, all resulting in a decrease in visitation. However, the Park Service believes that the growth in population in the Puget Sound area will result in increased visitation. In addition, the U.S. Forest Service comments on the plan (Letter A1) indicates that that agency is experiencing an increase in visitors from communities east of the Cascades, and that the park should expect to experience a similar increase.

**Comment:** The road improvements to State Route 410 will result in increased traffic more visitors stopping at the Tipsoo Lake area. This area already suffers from resource impacts related to unregulated visitor use and increased use would result in further degradation. (Sources: F14, G74, G78)

**Response:** In response to the ongoing road construction on State Route 410, the National Park Service will make some improvements in the Tipsoo Lake area, including constructing a comfort station and improving the parking area. A development concept plan and environmental assessment will be prepared for this area, and public comment will be sought during this planning effort. In addition, this *Final General Management Plan* indicates that the Chinook Pass / Tipsoo Lake area is a high priority area for visitor experience and resource protection.

**Comment:** What information does the National Park Service have to indicate that visitors will stop at welcome centers outside of the park? (Sources: F14, G74, G78)

**Response:** NPS experience across the country has shown that visitors want to get information before arriving at a park so that they can plan their visits better, using up-to-date information. At the welcome centers visitors will also be able to obtain park passes and climbing and wilderness permits, as well as information, permits, and passes to other regional attractions (e.g., Crystal Mountain tram rides). Visitors already stop at the existing Wilkeson and Enumclaw stations. There is no reason to expect that they will not stop at the welcome centers.

**Comment:** The National Park Service should consider the Cayuse Pass area for a visitor contact station to greet visitors arriving from the east.

**Response:** As noted on page 69 of the draft, visitor welcome centers would be established outside the park. These centers would offer information to visitors before they entered the park, which should help them to plan their visits. Although the specific locations of the welcome centers have not been identified, one welcome center would provide information to people traveling on State Route 410, including Cayuse Pass.

**Comment:** The park should encourage bicycle use by opening more areas of the park and improving the roads for bicycling. Bicycle racks are need throughout the park. (Sources F2, F14, G52, G74, G89)

**Response:** Bicycles are allowed in many areas of Mount Rainier National Park, including the main park roads, Carbon River Road, Westside Road, and Skate Creek Road. Increasing the number of areas where bicycles are allowed is limited because 97% of the park is designated wilderness, and bicycles are not a compatible use in designated wilderness. As shown on the National Historic Landmark District map, most park roads are in the designated district. This designation limits the types of improvements that can be made to roads, such as adding bi-

cycle lanes. Bicycle racks will be added in various areas of the park where appropriate.

**Comment:** The draft plan should have considered the appropriateness of maintaining the snow play area, because it is a financial drain on the park and are not appropriate in national parks. (Source: F16, G75)

**Response:** The National Park Service did consider eliminating the snow play area, as discussed under “Alternatives and Actions Considered but not Evaluated Further.” Although this use does not contribute to satisfying the purposes for which the park was established, it is not inconsistent with the park’s purposes. This activity, which many people enjoy, has been permitted for many years and has had a minimal impact on park resources.

**Comment:** The plan should consider building new campgrounds. (Source: G8)

**Response:** The preferred alternative calls for an additional campground in the proposed Carbon River boundary adjustment.

**Comment:** The “Affected Environment” chapter fails to identify all the existing picnic sites in the park. (Source: G75)

**Response:** You are correct. In the final document, Falls Creek and Paul Peak have been added to the list.

**Comment:** What strategy will be implemented for protecting park resources from the construction of the Foothills Rails to Trails Project? (Source: D2)

**Response:** The National Park Service supports the development of this trail. However, the trail is proposed to end at the existing park boundary, so the trail construction should not affect park resources. If the trail entered the park, an environmental compliance document would be prepared, as required under the National Environmental Policy Act, and the Park Service

would consult with the tribes and other appropriate agencies and organizations.

### Westside Road

**Comment:** The Westside Road could be engineered so that it could be kept open, or it could be rerouted. (Source G58)

**Response:** The National Park Service does not believe that a road can be engineered to withstand a glacial outburst. Under the preferred alternative, visitors could go to the area via a shuttle. This would eliminate the potential for private vehicles to become stranded on that road. An environmental assessment prepared for the Westside Road considered rerouting the road, but the idea was rejected because it is in designated wilderness and is part of the national historic landmark district.

**Comment:** The Westside Road should be removed and the area should be restored to natural conditions. Allowing private vehicles or shuttles to use the road would result in impacts on wildlife, special status species, air quality, and water quality. (Sources F9, F16, G62, G72, G73)

**Response:** In the past, the Westside Road allowed visitors to reach many scenic parts of the park. It is still used for hiking and bicycling. Removing the road would eliminate an opportunity for many visitors to enjoy the park (which would be contrary to the park’s purposes and mission goals) and would increase crowding in other parts of the park. Its removal also would adversely impact the national historic landmark district, a valuable cultural resource. The National Park Service believes that offering shuttle service on the Westside Road would enable people to visit this part of the park who otherwise might not be able to do so, and the resource impacts would be negligible to minor.

**Comment:** Operating a shuttle on the Westside Road would be impractical because of low

demand and the probability of a washout.  
(Source: G56)

**Response:** We acknowledge that a washout could occur in the future, but there is no way to predict when this might happen. In the interim, the National Park Service believes that there would be high interest in the shuttle, given past use of this area. As noted in alternative 2, continuing shuttle service on the Westside Road would be reexamined if a large stretch of the road was destroyed.

**Comment:** If the Westside Road can accommodate shuttles, then private vehicles should be allowed. (Source: G75)

**Response:** If the road was open to private vehicles, a washout would be likely to strand several cars, presenting operational and safety issues. Shuttle passengers could be evacuated more easily, and the shuttles could remain above the washout for several weeks or more. In addition, as noted on page 98 of the draft document, repairing and maintaining the road for private vehicles would be more costly, and many users enjoy not encountering motor vehicles on the road. Furthermore, as noted in the “Environmental Consequences” chapter, the potential for resource impacts would be higher if the road was open to private vehicles than if it was restricted to shuttles.

## **Wilderness**

**Comment:** The administrative designation of part of the Mount Rainier National Historic Landmark District within designated wilderness is not contrary to the Wilderness Act. However, the Park Service must not view the existence of the national historic landmark as in any way lowering the standards that protect wilderness. (Source: F16)

**Response:** The Park Service agrees that the designation of the Mount Rainier National Historic Landmark District does not lower the standards for protecting the wilderness. The *General Management Plan* will help protect both the wilderness and the district. NPS guidelines (NPS 1999f) state that historic properties within wilderness will be protected and maintained according to the pertinent laws and policies governing cultural resources, using management methods that are consistent with preservation of wilderness character and values.

## **AGENCY, TRIBAL, AND ORGANIZATION LETTERS**

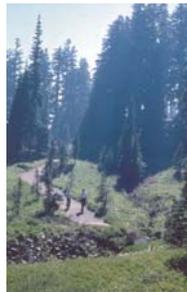
The comment letters from federal, state, and local agencies, tribes and private organizations are reproduced in this section.

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# **Appendixes / Bibliography / Preparers / Index**



# **APPENDIXES**

## **BIBLIOGRAPHY / PREPARERS / INDEX**

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## APPENDIX A: MOUNT RAINIER LEGISLATION

The following federal and state laws are included in this appendix.

- An Act To set aside a portion of certain lands in the State of Washington, now know as the Pacific Forest Reserve,” as a public park to be known as “ Mount Rainier National Park,” approved March 2, 1899 (30 Stat. 993).
- Act of Legislature of Washington, approved March 16, 1901, ceding to the United States exclusive jurisdiction over Mount Rainier National Park in the State of Washington (Laws of Washington, 1901, p. 192).
- An Act to accept the cession by the State of Washington of exclusive jurisdiction over the lands embraced within the Mount Rainier National Park, and for other purposes, approved June 30, 1916 (39 Stat. 243).
- Excerpt from “ An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1909, and for other purposes,” approved May 27, 1908 (35 Stat. 365). (Amends Sec. 5, 30 Stat. 993.)
- Excerpt from “ An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1918, and for other purposes,” approved June 12, 1917 (40 Stat. 152).
- An Act To revise the boundary of the Mount Rainier National Park in the State of Washington, and for other purposes, approved May 28, 1926 (44 Stat. 668).
- Excerpt from “ An Act To provide for uniform administration of the national parks by the United States Department of the Interior, and for other purposes,” approved January 26, 1931 (46 Stat. 1044).
- An Act To extend the south and east boundaries of the Mount Rainier National Park, in the State of Washington, and for other purposes, approved January 31, 1931 (46 Stat. 1047).
- An Act Authorizing the Secretary of the Interior to acquire on behalf of the United States Government all property and facilities of the Rainier National Park Company, approved September 21, 1950 (64 Stat. 895).
- An Act Authorizing the Secretary of the Interior to acquire on behalf of the United States Government all property and facilities of the Rainier National Park company, approved September 21, 1950 (64 Stat. 895).
- An Act To authorize the Secretary of the Interior to provide a headquarter site for Mount Rainier National Park in the general vicinity of Ashford, Washington, and for other purposes, approved June 27, 1960 (74 Stat. 219).

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## APPENDIX B: OTHER PLANNING EFFORTS

Several plans have influenced or would be influenced by the approved *General Management Plan* for Mount Rainier. These plans have been prepared by the National Park Service, the U.S. Forest Service, regional and county agencies, and site developers. Some of these plans are described briefly in this appendix.

### OTHER NATIONAL PARK SERVICE PLANS

#### **Mount Rainier Master Plan (1974)**

Mount Rainier National Park's 1974 *Master Plan* set the general direction for the park from the 1970s through the present. The plan established direction for the major visitor activity centers at Paradise, Sunrise, Longmire and guided the park's interpretive programs. It set the general direction for resource management (such as maintaining the subalpine wildflower fields and meadow), it zoned the park into five different classes, and it proposed several boundary adjustments. The plan noted that it is not possible to accommodate the large numbers of vehicles that come to the Paradise area and said that increasing parking lot size would compound problems, resulting in unacceptable impacts on resources and visitor experiences.

The *Master Plan* recommended that the park consider alternative methods of transporting people to Paradise and Sunrise and called for cooperation with private, local, and regional groups and other public agencies. It contained recommendations that many administrative operations at Longmire be moved to Tahoma Woods.

#### **“Statement for Management” (1988b)**

The “Statement for Management” for Mount Rainier National Park classified the park into four zones, which are described under the no-action alternative (continue current management) in this document. Four major resource issues were identified: human impacts on park ecosystems above 7,000 feet; the management of human wastes in the subalpine zone; human impacts on ecosystems below 7,000 feet (primarily high country trails and alpine meadow areas); and the protection of park natural resources from external threats. The “Statement for Manage-

ment” noted that weekend crowds were impossible for some areas to handle: campgrounds, picnic areas, parking areas, and some roads. The document also said that design capacity is overloaded about 10% of the time during summer and frequently on winter weekends.

#### **“Paradise Meadow Plan” (1989b)**

The “Paradise Meadow Plan” dealt with visitor use impacts in this popular area, documented the extent of human impacts, and presented guidelines for revegetating and protecting the area. It recommended changes for the maintained trail system, identified five-year revegetation goals, and proposed the approval of additional rest areas, interpretive exhibits, barriers, and signs. The plan recommended that park rangers “rove” the area to help reduce resource impacts, called for continued monitoring of the area, and recommended that winter camping and the use of winter trails should be allowed only when snow accumulation exceeded 5 feet.

#### **Wilderness Management Plan (1992c)**

Mount Rainier's *Wilderness Management Plan* set management goals and objectives for the wilderness area, established management zones, classified the wilderness area according to these zones, and established the limits of acceptable change for wilderness resource and social conditions through indicators and standards. It also set the standards for administrative use and for managing the wilderness (including structures in the wilderness, research, the use of watercraft, group and party size, and camping restrictions). After the *General Management Plan* is approved, the *Wilderness Management Plan* will be updated to be consistent with the directions in the approved *General Management Plan* pertaining to new zones, zone allocations, indicators and standards, and visitor use regulations.

#### **Sunrise Development Concept Plan / Environmental Assessment (1992b)**

The 1992 *Sunrise Development Concept Plan / Environmental Assessment* and the 1997 *Finding of No Significant Impact* called for several actions to protect resources and improve visitor services in the Sunrise area. The parking lot was to be redesigned to provide 214 auto spaces, 10 pull-through recreational vehicle

(RV) spaces, and 4 bus spaces. The plan also called for removing the Sunrise Lodge and constructing a new ranger station and concession facility on the same site.

#### ***Collections Management Plan (1994b)***

The *Collections Management Plan* for Mount Rainier National Park is a specialized planning document designed to help the park administer the museum collections. It contains specific recommendations for actions to be taken to improve the collection. The 1994 plan confirmed that none of the park's exhibits met NPS standards for the preservation and security of museum objects and recommended constructing a new curatorial storage facility. It also recommended establishing specified park funding and adding more seasonal, term, or permanent positions to ensure the proper management of park resources into the future.

#### ***Natural and Cultural Resource Management Plan (1999e)***

The *Natural and Cultural Resource Management Plan* for Mount Rainier National Park tiers off the long-term goals identified in legal mandates, other park plans, and NPS policies. Intended to describe how long-term resource goals will be achieved in Mount Rainier, this plan provides a working foundation for resource management actions in the park. It gives an overview of the status of the park's natural and cultural resources, describes current natural and cultural resource management programs and needs, and establishes criteria for prioritizing natural and cultural resource management projects. It also identifies more than 150 specific projects and actions that will be taken to address the park's most important resource problems and research needs. This plan will be revised as needed to incorporate the management directions provided by the *General Management Plan*.

#### **Fire Management Plan**

A collaborative fire management plan would be prepared between the park and other land management agencies. Eventually, the park staff would work toward developing a joint fire management plan with land management agencies on its boundary. This collaborative plan would ensure coordinated fire management across the principal U.S. Forest

Service / National Park Service boundary. Other surrounding national forests, including the Mount Baker-Snoqualmie and the Wenatchee National Forests, would also be part of the process. Based on fire history, topography, and other issues, the plan would identify fire management units throughout the park and would address wildland fire for resource benefits, suppression, mechanical hazard fuel reduction, prescribed fire, and other alternatives for the park's fire management program.

#### ***A Strategic Plan For Mount Rainier National Park 2000–2005 (2000b)***

The *Strategic Plan* was intended to serve as a framework for other planning efforts. It set strategic objectives and goals and identified management actions regarding resource stewardship, access, enjoyment, education, and interpretation, as well as actions for leadership, science and research, and professionalism. The plan also established priorities for allocating resources and assets to address natural and cultural resource problems, as well as a frame of reference for budget and short-range operating plans. It called for the implementation of a program to protect resources and enhance the visitor experience in wilderness and non-wilderness. It also called for inventorying and monitoring impacts on wilderness resources and developing partnerships with adjacent U.S. Forest Service wilderness managers. It also recommended reducing crowding in the wilderness by limiting trailhead parking and advocated, preparing a plan to provide for alternative forms of transportation and developing a volcanic/geologic hazards contingency plan.

#### **Comprehensive Interpretive Plan (in progress)**

The goal of the "Comprehensive Interpretive Plan" is to develop a cost-effective, focused, high-quality park interpretive program for all audiences. The foundation of this plan is a long-range interpretive plan that addresses themes and goals of the interpretive program; identifies the need for nonpersonal services, staffing, research, and partnerships; and outlines an annual implementation plan. The "Long-Range Interpretive Plan," a component of the "Comprehensive Interpretive Plan," was completed in 2000 (NPS 2000a). The "Long-Range Interpretive Plan" calls for improving existing interpretive exhibits and media throughout the park. This plan recommends renovating outdated exhibits and media at the Longmire museum, at the Paradise

Ohanapecosh, and Sunrise visitor centers, and at other visitor information facilities throughout the park to convey the park's purpose and significance and resource protection messages more effectively. The implementation of the highest priority projects is underway. The "Long Range Interpretive Plan," which will be updated according to the direction provided by the *General Management Plan*, along with corresponding tiered interpretive planning documents, will provide the detail needed to put any new visitor information and interpretation recommendations into action.

### **Mount Rainier Road Corridor Studies (Ongoing)**

The Federal Lands Highway Program, through the Transportation Endowment Act of the 21st Century (TEA-21), funded several Mount Rainier road corridor transportation planning projects, which cover all road corridors leading to the park. These projects are administered by the National Park Service's Alternative Transportation Planning Program, an NPS-wide initiative to address transportation issues and explore transportation options in and around national parks. They involve many stakeholders, including multiple agencies, tribal involvement, counties, local community members, and business interests.

Specifically, these corridor studies use the charette process, a high-energy, intensive, focused effort, to initially explore partnerships for meeting transportation needs in parks and gateway communities. The studies are intended to be consistent with agency, regional, county, and other local planning efforts. They attempt to further these efforts by highlighting key plan components and stakeholder initiatives, using transportation planning as a means to knit these components together.

There is a need at Mount Rainier National Park to alleviate traffic congestion during summer peak use periods. Gateway communities are interested in encouraging appropriate levels and kinds of tourism but are concerned about jeopardizing the quality of life. A two-part strategy was developed to address these concerns: alternative multimodal transportation and shuttle system concepts would be explored in partnership with other agencies and interests. Also to be explored would be opportunities to enhance existing or create new recreational opportunities in a

larger region so that visitation would be dispersed and congestion avoided in any given area.

### **Commercial Services Plan**

The purpose of the commercial services plan will be to establish a process for determining what types and levels of commercial activities are necessary and appropriate for Mount Rainier National Park. This plan will serve as a comprehensive guide for managing commercial services in the park for five to ten years, and it will address in more detail decisions about commercial activities proposed in the approved *General Management Plan*. Commercial activities that will be managed by this plan are contracts, commercial use authorizations, and special use permits for activities such as guiding and instructional services, commercial filming, weddings, festivals, and other special events.

### **OTHER FEDERAL, REGIONAL, AND LOCAL PLANS**

#### ***Northwest Forest Plan (1994b)***

The *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl: Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, commonly referred to the *Northwest Forest Plan* (U.S. Forest Service and Bureau of Land Management 1994b), consists of strategies for forest management, economic development, and agency coordination. The plan amends the forest management plans for 19 forests, including those that border Mount Rainier National Park. The forest lands surrounding Mount Rainier are managed in accordance with provisions of the *Northwest Forest Plan*, including the preservation and management of old-growth forests. Coordination between National Park Service and U.S. Forest Service personnel is required to ensure that the management of land use is compatible at the watershed and physiographic province level.

The *Northwest Forest Plan* establishes several land management categories. Lands reserved by an act of Congress for specific land allocation purposes, such as Mount Rainier National Park and wilderness areas bordering the park, are categorized as "congressionally reserved areas." The *Northwest Forest Plan* does not affect the management of congressionally reserved

areas, and this *General Management Plan* does not alter any of these congressionally mandated land allocations.

Two categories that allow for timber harvest at some level and lie adjacent to the park are late successional reserves and matrix lands.

- Most nonwilderness national forest lands bordering the park are in late successional reserves (LSRs). These areas are managed over the long term to maintain a functional, interactive, late-successional and old-growth forest ecosystem and to provide habitat for related species, including the northern spotted owl. Although certain thinning and silvicultural practices are allowed, they can be practiced only in stands up to 80 years of age and only if the treatments would be beneficial to creating and maintaining late-successional forest conditions. Salvage activities also are allowed if they would have either a beneficial or a neutral effect.
- Matrix lands are national forest areas where most commercial timber harvest and other silvicultural activities take place. Forested and non-forested areas that may be technically unsuited for timber production are not included. Matrix lands are scattered on land managed by the U.S. Forest Service along or near the southwest, northwest, and northeast corners of the park and adjacent to the Mather Memorial Parkway.

**Wenatchee National Forest *Land and Resource Management Plan* (1990), as amended by the *Northwest Forest Plan***

The *Land and Resource Management Plan* for Wenatchee National Forest proposes implementing the following management strategies: (a) establish a spotted owl network, (b) evaluate roadless areas for permanent status, (c) evaluate and recommend appropriate rivers for inclusion in the national wild and scenic rivers system, and (d) maintain and moderately increase the acreage for recreational opportunities.

**Gifford Pinchot National Forest *Land and Resource Management Plan* (1990), as amended by the *Northwest Forest Plan***

The *Land and Resource Management Plan* for Gifford Pinchot National Forest proposes the following actions: (a) maintain harvest levels that are sustainable over the long term while protecting aquatic and late-successional forest resources, (b) maintain or improve wildlife habitat, especially for species associated with late-successional forests, (c) maintain and enhance aquatic habitats, (d) moderately increase motorized and nonmotorized recreational opportunities, (e) evaluate and recommend appropriate rivers to be included in the national wild and scenic rivers system, and (f) protect scenic quality, views, and viewsheds.

**Mount Baker-Snoqualmie National Forest *Land and Resource Management Plan* (1990), as amended by the *Northwest Forest Plan***

The *Land and Resource Management Plan* for Mount Baker-Snoqualmie National Forest established land allocations and management goals and objectives for the national forest system lands surrounding the northern portion of Mount Rainier National Park. The area includes the Clearwater Wilderness and parts of the Norse Peak Wilderness, which are managed to preserve the wilderness character for the use and enjoyment of visitors, in a manner consistent with the Wilderness Act of 1964. The area now managed for wilderness is designated as a late successional reserve (providing habitat for late-succession and old-growth related plant and animal species, including the northern spotted owl).

***Pierce County Comprehensive Plan* (1999a)**

The land use element of the 1994 *Pierce County Comprehensive Plan* describes an urban growth boundary encompassing one-third of the county, generally surrounding the Puget Sound area. Less intensely settled outlying areas (rural, resource, open space, and government lands) would comprise the other two-thirds of the county. Two objectives of the plan are to retain the rural character and activities in these outlying areas and to avoid the fragmentation or subdivision of farmlands and open spaces. Most of the land surrounding the park is designated as forestland, as part of the land use element of the plan. Lands surrounding Washington Highway 706 and bordering the Nisqually entrance are zoned to as rural 10, which allows a density of one residential unit per 10 acres, with a maximum of

2.5 units per 10 acres if 75% of the site is designated as open space (see the amendment to the *Upper Nisqually Community Plan*, below.)

### **Lewis County Comprehensive Land Use Plan (1999)**

All lands near Mount Rainier's southern boundary are designated as natural resource areas in the current *Comprehensive Land Use Plan* for Lewis County. This land use designation is given to continuous forestlands with at least 5,000 acres. One county policy states that any land use activities in or near lands with resource natural area designation should be sited and designed to minimize conflicts with resource management and other activities. However, the primary uses for natural resource lands are commercial timber production, mineral resource extraction, recreation, watershed, wildlife, viewshed, utility sites, and lines, and electronic and communication facilities.

### **King County Comprehensive Plan 2000**

The "Executive Recommended" *King County Comprehensive Plan 2000* is the first significant revision of the plan since its adoption in 1994. The plan advances these main themes: (a) creating livable communities, (b) linking land use and transportation, (c) maintaining the rural legacy, and (d) protecting the environment. In addition, the plan initiates policy changes that may be required under the Endangered Species Act. The *Comprehensive Plan* guides land use and development throughout the unincorporated portions of King County.

Protecting a rural way-of-life in King County is a major tenet of the plan. Conserving King County's rural and natural resource lands is integral to providing diversity in lifestyle choices, continuing farming and forest economies, protecting environmental quality and wildlife habitat, and maintaining a link to King County's resource-based heritage.

Under the environmental chapter of the plan, King County pledges to continue to work closely with other jurisdictions, federal and state agencies, tribes, interest groups, special districts and citizens; to protect and conserve the natural environment; to save salmon; and to maintain the quality of life.

Although none of the Mount Rainier National Park is in King County, south King County is less than 15 miles from the north boundary of the park. Consequently, the corridors of State Routes 410, 164, 169, and 165 lead through King County to the park's northeast and northwest areas and influence the experience of park visitors. Therefore, King County planning is relevant to the park.

### **Yakima County Plan 2015 (1998)**

Most of the land in the western part of Yakima County is designated as a forest resource in the *Yakima County Plan 2015*. The goals for forest resource land are to preserve, stabilize, and enhance the primary forest land base, which is being used for, or offers the greatest potential for, the continued production of forest products and harvesting. Some areas along State Route 410, about 25 miles east of Mount Rainier, have been designated as "rural self-sufficient" and "rural remote." These designations are intended to maintain a rural atmosphere by encouraging low residential densities, reducing the potential for sprawl, and retaining large open spaces.

### **Nisqually River Management Plan (1987)**

The *Nisqually River Management Plan* recognizes the unique cultural, historical, environmental, and economic resources of the Nisqually River basin and is more a stewardship or protection plan than an action plan. The Nisqually River Council and its Citizens Advisory Council include individuals representing the interests of federal, state, and local government entities (including Mount Rainier National Park), agriculture, forestry, the Nisqually Indian Tribe, other property owners, and environmentalists. Working together, they seek ways to protect and enhance the river basin through collaboration, advocacy, and education.

### **Lower Puyallup Watershed Action Plan**

The *Lower Puyallup Watershed Action Plan* is an effort to solve problems of nonpoint water pollution in the Lower Puyallup River subdrainage watershed. The watershed covers a 117,000-acre area, which includes land from Buckley to Commencement Bay and south King County to Orting. The plan area includes more than a dozen cities and towns and more than 200,000 residents with many diverse interests.

At the headwaters of the Puyallup River (as well as the White and Carbon Rivers that confluence with the

Puyallup), Mount Rainier National Park is involved with other federal, state, and local government entities, agriculture, forestry, the Puyallup and Muckleshoot Indian Tribes, other property owners, and environmentalists in working together to seek ways to protect and enhance the river basin through collaboration, advocacy and education.

### ***Upper Nisqually Valley Community Plan (2000)***

The *Upper Nisqually Valley Community Plan* is an amendment to the Pierce County *Comprehensive Plan*. The final supplemental environmental impact statement was approved on January 1, 2000. This plan applies to land adjacent to the park's southwest boundary, including the gateway communities of Alder, Elbe, and Ashford. The plan sets forth planning and land use policies and alternative growth scenarios to direct future land use decisions in the Upper Nisqually area. It outlines several elements and visions for the area to protect critical areas and preserve natural vegetation, to direct growth into community-planned centers and maintain the rural character of the valley, to diversify the economic base and promote tourism, to promote historic preservation and the preservation of views and viewsheds, and to provide the basic facilities needed to maintain the whole system. Coordination between National Park Service and community plan officials is underway to ensure that any impacts on park resources are minimized and that visitor needs (beyond what the park can provide) are accommodated through gateway services.

### ***Chinook Byways Corridor Planning and Management Guidebook and Action Plan***

The *Chinook Byways Corridor Planning and Management Guidebook* covers the segment of State Route 410 that extends from east of Enumclaw to the beginning of the Mather Memorial Parkway. This part of the highway runs through both public and private forestlands, as well as through the historic community of Greenwater. This corridor plan meets the following objectives (among others):

- to provide guidance for solving existing problems along the corridor

- to describe existing conditions and intrinsic qualities
- to provide a starting point for future corridor planning, management, and implementation
- to serve as a community-based planning document that broadly and generally addresses diverse interests throughout the corridor.

An action plan outlines projects, programs, strategies, and ideas for achieving the vision for the corridor. Benefits of the action plan include preserving and enhancing intrinsic qualities, improving road safety, balancing the needs of corridor users, promoting and marketing the corridor, and preserving and enhancing the visitor's experience.

In 1998 the Mather Memorial Parkway, along with the rest of State Route 410 from Enumclaw to Naches (approximately 93 miles), was designated an "All American Road" within the national scenic byways program because of its significant natural, scenic, recreational, and cultural resource values. With this recent designation, a committee is being organized to incorporate the Chinook Byway, Mather Memorial Parkway, and the section of State Route 410 from Cliffdale to Naches into a single management planning effort for an "All-American Road" comprehensive corridor.

### **Foothills Rails To Trails Project**

Pierce County has partially completed the Foothills Trail along the Carbon and Puyallup Rivers. The trail is designed to be a 26-mile segment of Pierce County's "Nisqually Delta/Mount Rainier Trail Master Plan," which was developed in 1989. The Foothills Trail segment will connect the towns of McMillin, Orting, South Prairie, Buckley, Wilkeson, and Carbonado. The proposed 9-mile Mount Rainier extension will lead to the northwest corner of Mount Rainier National Park, at its Carbon River entrance. The trail also will provide a protective greenway along major stretches of both rivers in one of the fastest growing regions of the country.

## APPENDIX C : DESCRIPTIONS OF THE PARK MANAGEMENT ZONES

**TABLE C-1: WILDERNESS MANAGEMENT ZONES**

Zone Summary	Natural Resource Conditions	Cultural Resource Conditions	Visitor Experience	Facilities and Structures
<b><i>Research Natural Area Zone</i></b>				
This zone would be an unmodified landscape where unimpeded natural processes could proceed, significant cultural resources would be preserved, focus on baseline ecological research; no visitor impacts; research and monitoring devices might be evident; few visible signs of human use, and access only for approved research and education.	In general there would be no visible signs of human use; natural ecological functions, components, and processes would not be influenced by recreational use; some user-developed routes might exist for access to research and study areas; permits required for research use and for associated camping.	Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are prehistoric and historic archeological sites and ethnographic resources; permits required for research use and associated camping.	Because this zone would be designated for research, no recreational visitor use would be permitted, but offsite interpretation and education might be available.	No permanent administrative or visitor use facilities in this zone; no trails of any kind; research or monitoring devices might be evident.
<b><i>Pristine Zone</i></b>				
This zone would be a landscape where unimpeded natural processes could proceed, signs of human use minimal; significant cultural resources would be preserved; no maintained trails, travel primarily cross-country, abundant opportunities for solitude; high degree of self-reliance needed to enjoy these areas.	Natural ecological functions, components, and processes would be minimally influenced by recreational use; natural landscape unmodified, with the only possible exception being significant cultural resource structures.	Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are prehistoric and historic archeological sites and ethnographic resources.	Visitors might experience a high sense of adventure and exploration; plentiful opportunities for solitude; few chances of meeting park staff or other visitors; activities would depend on cross-country foot travel; day and overnight party size limited; no designated campsites or marked trails; permits required for dispersed camping, adherence to Leave No Trace standards required (no camping within 100 feet of surface water); no onsite interpretation or signs, but offsite interpretation and education encouraged; few opportunities to learn more about park resources because little area-specific information from park and commercial publications, low potential for contacts with other people; high amount of outdoor skill needed; level of risk high because trails and other people not present.	No designated campsites would exist; marked routes (trails, blazes, cairns, signs) generally would not be present, but unmaintained, constructed trails might be present; temporary wandering would be permitted on snow for resource protection and safety reasons; use of research equipment and monitoring devices might be allowed; significant cultural resource structures also might be present.

Zone Summary	Natural Resource Conditions	Cultural Resource Conditions	Visitor Experience	Facilities and Structures
<b><u>Primitive Zone</u></b>				
<p>Zone would be a nearly unmodified landscape with natural processes unimpeded and significant cultural resources preserved; subtle signs of human use might be present in parts of zone because way trails would continue to be created and used and campsites designated; opportunities for solitude high, travel still primarily cross-country, but encounters with people more likely than in pristine zone; visitors would feel apart from other people in wilderness but not entirely alone; high degree of self-reliance needed to enjoy these areas.</p>	<p>Natural ecological functions, components, and processes would not be influenced by recreational use except for a few minimal modifications to hydrology, plants, and soils in localized areas resulting from significant cultural resources and a few hiker-created travel routes and campsites.</p>	<p>Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are prehistoric and historic archeological sites and ethnographic resources.</p>	<p>Visitors might have a moderate sense of adventure and exploration; opportunities for solitude common; some possibility to encounter other people and some signs of human use (more than in pristine zone), visitors might feel apart but not alone; most activities would depend on cross-country foot travel; permit needed for dispersed camping, also adherence to Leave No Trace standards (no camping within 1/4 miles of any trail or 100 feet of surface water); a few designated campsites might be present in sensitive alpine areas; size of day and overnight parties limited; some way trails; no onsite interpretation or signs, but offsite interpretation and education offered; good outdoor skills needed but not as much as in pristine zone because some user-created routes and more chance of meeting others.</p>	<p>Same as in pristine zone except possibly a few designated campsites to protect sensitive areas; some primitive routes (way trails) and unmaintained constructed trails might exist, but no maintained markers such as signs, blazes, or cairns.</p>
<b><u>Seminprimitive Trail Zone</u></b>				
<p>Zone mostly a nearly unmodified landscape with natural processes unimpeded and significant cultural resources preserved; visitors could enjoy wilderness hiking with a moderate potential for social interaction; moderately maintained trails in narrow (4 feet) corridors with associated signs, thus highly modified; possibly other visitor and administrative structures such as trailside camps.</p>	<p>Natural ecological functions, components, and processes would not be influenced by recreational use except in a minor part of this zone; natural conditions intentionally modified in areas within trail corridors and around designated campsites; zone about 0.5 mile wide to allow for rerouting trails if required by changes in natural conditions such as floods or major windthrow.</p>	<p>Cultural resources would be preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; preservation, rehabilitation, or restoration used to maintain significant cultural resources such as patrol cabins, fire lookouts, trail shelters, historic trails, and other cultural landscape features; routine or regular administrative use would be made of some cultural resources, such as patrol cabins; other cultural resources, such as trail shelters, might be used intermittently by visitors.</p>	<p>Visitors could sense adventure and exploration; signs of human use and structures readily apparent in localized areas; travel on foot along user-developed and maintained trails, with people widely dispersed; opportunities for solitude relatively common but interspersed with opportunities for social interaction; size of day and overnight parties limited; permit needed to camp in designated camps (with marked campsites) where a moderate number of people might be encountered; (few opportunities to camp apart from others in peak periods); no onsite interpretation and education offered, but signs on trails and in camps would give miles, direction, warnings, and resource protection data; offsite interpretation and education offered; visitors could understand and appreciate cultural landscape; knowledge and skills needed lower than in pristine and primitive zones because more trails and more people.</p>	<p>Moderately maintained trail(s) in 4-foot corridors; associated trail structures like culverts, bridges, and tumpiking might be present; signs on trails, in camps, at trailheads and trail junctions would give miles, direction, warnings, resource protection information; designated routes and user-developed trails marked or flagged for safety; unmaintained constructed trails might be present; temporary wandering on snow permitted to protect resources or for safety; dispersed wilderness campgrounds (trailside camps) with designated campsites available; possibly other structures allowed by the Wilderness Act, such as primitive toilets, patrol cabins, shelters, fire lookouts, and radio repeaters; research equipment and monitoring devices might be allowed; essential administrative or minor utility systems might be present.</p>

Zone Summary	Natural Resource Conditions	Cultural Resource Conditions	Visitor Experience	Facilities and Structures
<b><u>Transition Trail Zone</u></b>				
<p>Zone mostly a nearly unmodified landscape with natural processes unimpeded and significant cultural resources preserved; visitors could enjoy wildemess hiking with a high potential for social interaction; development same as in semiprimitive zone; but more evidence of human use; well-maintained trails in 8-foot corridors, thus highly modified.</p>	<p>Same as semiprimitive zone, except natural ecological functions, components, and processes intentionally modified, influenced by recreation in a larger area; zone about 0.5 mile wide to allow for rerouting trails if required by changes in natural conditions such as floods or major windthrow.</p>	<p>Same as semiprimitive zone.</p>	<p>Same as semiprimitive zone except for number of people that might be encountered; opportunities for solitude uncommon, and many opportunities for social interaction; in designated camps chance of encountering many people; visitors widely dispersed or concentrated along well-maintained trails.</p>	<p>Same facilities as semiprimitive zone might be permitted, except possibly more trailside camps and trails dispersed through zone; campsites might be more closely spaced.</p>
<b><u>Moderate Use Climbing Zone</u></b>				
<p>Zone mostly a nearly unmodified landscape with natural processes unimpeded and significant cultural resources preserved; few visible signs of human use except for a few climbing routes and designated campsites, other wilderness-appropriate structures; visitor experience oriented toward mountaineering, low to moderate potential for social interaction; although dispersed use would be prevalent, there often would be a delineated route toward summit.</p>	<p>Recreational use would not influence natural ecological functions, components, and processes except in a minor part of zone; areas intentionally modified in narrow trail corridors through snow and alpine environments and in a moderate number of designated and dispersed camps for hikers and climbers; measures to control impact of human waste used to limit damage to sensitive resources in this alpine and permanent snowfield zone; where zone contains only trail corridors, zone about 0.5 mile wide to allow for rerouting trails if required by changes in natural conditions such as snowmelt and crevasse patterns.</p>	<p>Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are prehistoric and historic archeological sites and ethnographic resources.</p>	<p>Main activity in this zone would be mountaineering, but there could be day hikers, and commercial guide services might be permitted; visitors could sense a high degree of adventure and exploration while encountering a moderate number of other visitors; many opportunities for solitude, but also potential for much social interaction; high amounts of self-reliance and outdoor skills needed because of inherent dangers in terrain and climate; most travel would be cross-country but could be some way trails or routes, and some routes would have no commercial use; limits on public and commercial day and overnight use and party size; permits needed for wilderness camping and climbing; camping primarily dispersed but possibly designated trailside camps and a few designated campsites to protect sensitive alpine environment; adherence to Leave No Trace standards required except in areas with designated campsites; no onsite interpretation or signs, but offsite interpretation and education available.</p>	<p>Where not well-defined by foot traffic, routes might be temporarily wanded to ensure visitor safety or protect sensitive alpine resources; some way trails and unmaintained constructed trails might be present; a few designated campsites available in sensitive areas, and other structures allowed by the Wildemess Act might be permitted such as toilets, radio repeaters, and cultural resources; rock walls or shelters might be permitted in certain places; research equipment and monitoring devices might be allowed.</p>

<b>Zone Summary</b>	<b>Natural Resource Conditions</b>	<b>Cultural Resource Conditions</b>	<b>Visitor Experience</b>	<b>Facilities and Structures</b>
<b><i>High Use Climbing Zone</i></b>				
Zone would be similar to moderate use climbing zone, but more people would be present and there would be a moderate to high potential for social interaction.	Same as moderate use climbing zone, but more designated, well-dispersed campsites where areas would be intentionally modified.	Same as moderate use climbing zone.	Same as moderate use climbing zone except that more people would be encountered; few opportunities for solitude, and potential for a high degree of social interaction.	Same as moderate use climbing zone.

**TABLE C-2: NONWILDERNESS MANAGEMENT ZONES**

<b>Zone Summary</b>	<b>Natural Resource Conditions</b>	<b>Cultural Resource Conditions</b>	<b>Visitor Experience</b>	<b>Facilities and Structures</b>
<b><i>Primitive (formerly Undeveloped) Zone</i></b>				
This zone generally would be managed like primitive zone in the wilderness area, as an unmodified landscape with natural processes unimpeded and significant cultural resources preserved; only signs of human use would be some way trails and possibly some maintained trails; visitors could be apart from but relatively close to developed areas; although not part of designated wilderness, mechanized use would not be permitted, but unlike other wilderness zones, overnight use would not be permitted	Natural ecological functions, components, and processes would not be influenced by human use except for minimal modifications of soils, hydrology, and plants in localized areas by significant cultural resources and a few user-made travel routes.	Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are prehistoric and historic archeological sites and ethnographic resources.	Visitors could experience a feeling of exploration while being near developed facilities; few people present, many opportunities for solitude; cross-country hiking would be primary focus, but some maintained trails and user-developed way trails would exist; no overnight or mechanized use; skills and knowledge needed because few facilities and other people; in the winter access would not be provided to the zone; no onsite interpretation or information; but offsite interpretation and education might be available.	No visitor facilities except trails and associated structures; trail structures such as culverts, bridges, turnpiking, and signs might be present; some way trails also might be present.

Zone Summary	Natural Resource Conditions	Cultural Resource Conditions	Visitor Experience	Facilities and Structures
<b><u>Sensitive Resource/ Recreation Zone</u></b>				
<p>This zone would be applied to areas whose easily accessible resources have a high potential for damage; landscape generally natural, only slightly modified by facilities and structures in localized areas; signs of human use few and limited to designated trails, facilities, and use areas; visitors, closely managed to minimize impacts, could experience resources but would remain relatively close to developed areas; a high degree of social interaction possible, but experience of park resources generally unimpeded by others.</p>	<p>Natural ecological functions, components, and processes would not be influenced by recreational use except in a small part of zone; environment intentionally modified in trail corridors (about 10 feet wide) and a few designated campsites; where zone applied only to trails, zone would be about 100 feet wide to accommodate rerouting trails when required by natural conditions</p>	<p>Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are prehistoric and historic archeological sites, historic structures, cultural landscapes, and ethnographic resources.</p>	<p>Visitors could see and enjoy natural and cultural resource attractions while still being near developed facilities; could pursue a variety of nonmotorized and nonmechanized activities and use wheelchairs on designated trails, but to protect sensitive resources, no cross-country travel permitted in summer; no stock use permitted; many people present, few opportunities for solitude; a high degree of social interaction, but visitors could move along trails relatively freely; could experience park resources near developed facilities and not be impeded by others; camping might be permitted, but only in designated trailside camps and shelters in summer; (in winter, cross-country camping permitted near developed areas); overnight party size limited; no special skills or knowledge needed to use these areas, but visitors informed about minimum impact practices; bulletin boards, way-side exhibits, signs, and formal/informal interpretive programs would give information; in winter access not facilitated by mechanized or motorized means (e.g., grooming equipment).</p>	<p>Trails well-defined, highly maintained, usually with many trail structures, some unmaintained, constructed trails might be present; a few designated trailside camps, walk-in picnic areas, and a few small restrooms, benches, and shelters, available No roads provided in this zone.</p>

Zone Summary	Natural Resource Conditions	Cultural Resource Conditions	Visitor Experience	Facilities and Structures
<b><u>Roaded Multiuse Zone</u></b>				
<p>Natural landscape noticeably modified by graveled roads, trails, walk-in campgrounds and picnic areas, small buildings; much social interaction; visitors would arrive and experience park resources by horse, bicycle, or hiking on trails or roads; motor vehicles permitted only for administrative use, as shuttles, or to transport people with disabilities</p>	<p>Natural ecological functions, components, and processes moderately modified intentionally in 50-foot unpaved road corridor and by developments in localized areas; zone would be 200 feet wide.</p>	<p>Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are historic roads as designed, and attendant bridges and culverts, prehistoric and historic archeological sites, and ethnographic resources such as traditional routes.</p>	<p>Visitors could see resources via trails or graveled roads; roads and associated structures would foster feeling of an area untouched by time ecologically and historically; nonmotorized recreational activities permitted such as bicycling, hiking, horseback riding, cross-country skiing, snowshoeing, and walk-in camping; motor vehicles might be allowed for shuttles, to transport visitors with disabilities, and for administrative purposes; no cross-country travel in summer; many people present and few opportunities for solitude; no special skills or knowledge needed; summer camping allowed only in walk-in campgrounds, cross-country camping allowed in winter; motorized winter access might be available (grooming equipment); interpretation available but concentrated at trailheads and camps</p>	<p>Graveled roads, entrance stations, and small buildings like those listed for the sensitive resource / recreation zone might be present; new trails might be located in roadbeds; some limited parking; visitor and administrative facilities generally well-concealed, being almost unnoticeable from road corridor(s); structures along roadways, (rock walls and stone-faced concrete bridges) designed to ensure ecological and historical consistency.</p>
<b><u>Visitor Facilities Zone</u></b>				
<p>Zone would offer highly structured opportunities to enjoy and learn about park; many facilities and services available, usually in a concentrated area; only in this zone could people find lodges, visitor centers, and drive-in campgrounds; much social interaction; natural processes and natural landscape might be highly modified.</p>	<p>Natural ecological functions, components, and processes intentionally modified to varying degrees, depending on type of visitor facility (less in campgrounds and in Camps Muir and Schurman, more in visitor center parking areas).</p>	<p>Cultural resources preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy; significant cultural resources that might be preserved are cultural landscapes and landscape features such as buildings, structures, roads, bridges, natural areas, and topographic features; historic buildings and other attendant features of the national historic landmark district; prehistoric and historic archeological sites, and ethnographic resources such as traditional routes.</p>	<p>Visitors could experience much social interaction while acquiring information and the conveniences needed to experience park resources; motorized and nonmotorized uses available, including attending interpretive programs and exhibits, scenic driving, walking, dining, picnicking, camping, and other activities available in highly developed areas; many people present and almost no opportunity for solitude; no special skills or knowledge needed; in winter access may be provided by mechanized or motorized means (grooming equipment); formal and informal interpretive programs available frequently; delivery concentrated at visitor centers, trailheads, parking areas, and pullouts.</p>	<p>Many visitor facilities and some administrative facilities present; all types of visitor-related buildings permitted in this zone, only zone where visitor centers, lodges, paved roads, and drive-in campgrounds permitted; access by paved and graveled roads as well as trails; facilities accessible to all visitors; utility developments present but as much as possible not evident.</p>

Zone Summary	Natural Resource Conditions	Cultural Resource Conditions	Visitor Experience	Facilities and Structures
<b><i>Administrative Zone</i></b>				
<p>The primary purpose of this zone would be to support the management and operation of the park. The zone would be highly developed with concentrations of administrative facilities. General visitation would not occur, although some visitors might access these areas to obtain staff assistance, to solve a problem, or to learn about historically significant buildings.</p>	<p>Natural ecological functions, components and processes would be intentionally modified to various degrees, depending on type of administrative facility (less with trails to water supplies, more in park maintenance and housing areas).</p>	<p>Cultural resources would be preserved consistent with <i>Secretary of the Interior's Standards</i> and NPS policy. Significant cultural resources that might be preserved in this zone are historic buildings and attendant features, prehistoric and historic archeological sites, and ethnographic resources (such as traditional routes).</p>	<p>Visitor recreation opportunities would not be offered. However, some use might be allowed so visitors could see and learn about historically significant buildings. Minimal interpretive information would be available in the zone.</p>	<p>This would be a highly developed zone with all types of administrative-related buildings. Where feasible, facilities separated or screened from visitor-use areas. Access would be via some paved and gravel roads and parking areas, except use would be primarily for administrative purposes.</p>

## APPENDIX D: EXAMPLES OF POTENTIAL INDICATORS AND STANDARDS FOR MOUNT RAINIER NATIONAL PARK

All general management plans for units managed by the National Park Service must by law address the issue of carrying capacity. Carrying capacity is a determination of what types and levels of visitor use can be accommodated while maintaining resource and social conditions consistent with the purposes of the park, its mission goals, and the prescriptive management zones. There are three major components of carrying capacity: *physical capacity* (e.g., parking spaces, facility space, road capacity); the *visitor experience* (e.g., congestion in parking areas, opportunities for solitude), and *resources* (which specify conditions of natural and cultural resources). The carrying capacity in a given area could be exceeded for any of these components, which would trigger management action.

The alternatives of this plan include a carrying capacity framework for the park. The carrying capacity model sets measurable standards and indicators that let park managers know when the experience and resources are in decline and action is needed. Indicators are specific, measurable variables that can be monitored to determine the quality of natural and cultural resource conditions and visitor experiences. Standards identify the minimum acceptable conditions for each resource or social indicator. The standards are set at levels or conditions to warn when management actions are merited.

Evidences that action may be needed in some areas and for some conditions have already appeared in several forms. Increasing visitor use has resulted in changes in the park's resources and in the visitor experiences. Resource damage has occurred in several areas, such as the Paradise meadows and Spray Park. With continued increases in visitor use levels, there is the potential that unacceptable changes could occur to park resources and visitor experiences – changes that would be contrary to the purposes and significance of the park and the mission of the National Park Service.

The carrying capacity concept does not necessarily mean a set number of people can be in the park on any given day and others will be turned away. It does mean that park staff, based on resource and visitor experience indicators, would take actions,

from the least restrictive (such as education) to possible restrictions on numbers (as the last resort), to maintain the highest quality park resource and experience.

### CARRYING CAPACITY FRAMEWORK

Under the preferred alternative, a carrying capacity framework would be established for Mount Rainier. This approach to addressing carrying capacity would be similar to the wilderness limits of acceptable change (LAC) process that has been used to monitor and manage the Mount Rainier Wilderness since 1989. Each park management zone described previously would have its own goals for long-term natural, cultural, and social (visitor) conditions. The carrying capacity concept is implemented as a series of management prescriptions not for controlling the numbers of people, but as prescriptions for desired ecological and social conditions in the management zone.

Decisions regarding the need to take action, such as when to apply protective measures to damaged areas, or when to initiate different visitor education programs, are based on a multiple phased process. The process is applied to all park management zones. It identifies zone-specific management actions compatible with the area's resources that achieve the intended resource condition and/or visitor experience. The framework involves five key steps.

- Establish near- and long-term visions for desired physical, ecological, and social conditions in the park, which relies on a good inventory of park resources and visitor uses.
- Define each park management zone, which includes desired conditions for visitor experiences and resources for both wilderness and nonwilderness areas. Management zones are proposed as part of each plan alternative (see appendix B).
- Select indicators and set standards for each indicator, which is done on a resource and visitor experience specific basis. Separate indicators and standards can be set for each management zone. Define each park management zone, which includes desired conditions for visitor experiences and resources for both wilderness and

nonwilderness areas. Management zones are proposed as part of each plan alternative (see appendix B). Define each park management zone, which includes desired conditions for visitor experiences and resources for both wilderness and nonwilderness areas. Management zones are proposed as part of each plan alternative (see appendix B).

- Develop and implement a monitoring program to track attainment and maintenance of desired conditions for each zone and resource by measuring or estimating specific resource and visitor experience indicators. Measurement results are then compared to standards selected as thresholds for taking management action. Monitoring documents when a management action is needed to keep conditions within the standards. Monitoring would be an on-going task starting with the implementation of this plan.
- Take management actions as necessary to improve the situation and achieve the desired conditions within the zone if resource conditions or visitor experiences are out of standard or monitoring indicates a downward trend in conditions. Management actions could range from low intrusiveness (such as education and signing) to highly restrictive (such as closures or use limits). Park managers would implement the least intrusive actions first, and evaluate their effectiveness before taking the next level of action.

## POTENTIAL NATURAL RESOURCE INDICATORS

The following examples identify natural resource indicators that may be applied to various resources. These potential resource indicators address soils, vegetation, air quality, aquatic resources, noise, wildlife, and trails. Standards would need to be developed for potential indicators. These examples would be considered for future resource monitoring applications.

### Soils

Bare ground can indicate an area that is used or trampled beyond the capability of vegetation to recover. Bare ground (not associated with trails)

can be measured as the extent of denuded area and the proportion of overall plant ground cover in a defined area.

Extent of area that has been denuded can be measured showing changes in size. This works well for picnic areas, campsites, areas adjacent to parking and pulloffs. Standards can be established for total acceptable area of impact in a larger context (i.e., a developed area such as Longmire or a wilderness campground) or acceptable area of unvegetated soils for each unit (i.e., wilderness campsite, nonwilderness campsite). Standards for wilderness campsites have been developed for the existing wilderness zones. They are: trailside zone — about 45 square yards for group campsites and about 30 square yards for individual sites; cross-country zone — about 3 square yards, more than about 45 yards from closest campsite, no more than 5 campsites/500 acres; alpine zone — no new campsites, camping in current sites and on snowfields, designated sites. Generally this approach would identify effects after they have been occurring for an extended period or are created by more than one person.

Generally when vegetation, litter and cryptobiotic soils decrease, the site is on its way to bare ground. Overall ground cover by type can be determined, and minimum ground cover standards could be established by looking at various impact sites in various communities and on various soil types.

Soil compaction can be measured with a soil penetrometer. Standards can be developed by measuring compaction in various degrees of visitor use in various soil types as described above. Chemical characteristics and biotic composition change with compaction. Soil samples from various impacts can be analyzed for nematodes, fungi, and chemical characteristics.

### Vegetation (Nonnative Species)

An increase in number of nonnative plant species present on a site can indicate recreational effect; however, an increase in abundance may be a result of other factors as well. Although the number of nonnative species and area occupied by these species should be monitored, they may not be a good indicator of human impacts.

Changes in the diversity and abundance of nonnative species can be measured in several ways using conventional vegetation sampling techniques,

including: species list for an area or trail, transects and Daubenmire plots, point-intercept, and line or belt transects. Collecting plant species diversity and abundance data from specific locations regularly through time enables estimates of trends and the speed of vegetation changes.

### **Vegetation (Species diversity/richness)**

A shift from plant communities dominated by forbs to those dominated by graminoids (grass and grass-like plants) often indicate excessive trampling in numerous plant communities, particularly in alpine and subalpine settings. Graminoids are generally more resistant to poor growing conditions than forbs. Also, some forbs are more resistant than others and could be used as early indicators. A series of transects covering a range of conditions from moderate to high-use areas to unused areas can be established with species diversity, species composition, and richness being measured with Daubenmire plots at various intervals along the transect. With sufficient sampling, statistical trends correlating plant composition and visitor use patterns can be established to show, for example, which species are resistant and distance from the main source where changes occur. Standards can then be developed using specific species presence, species diversity, species richness, and percent cover of graminoids and forbs.

### **Air Quality**

The air quality of Mount Rainier is protected as a Class I area under the Clean Air Act. Changes in air quality approaching unacceptable levels could indicate need for action. Recreational use can affect local air quality by creating emission sources such as campfires in nonwilderness campgrounds (such as Cougar Rock and Ohanapecosh) and by operation of motor vehicles along the park's roadways. Reductions in visibility, negative effects on public health, and possible damage to soils and other air quality-related impacts can result.

Both qualitative and quantitative measurement methods can be used to track changes. Qualitative approaches can include estimating the relative amount of reduced visibility of distant scenes observed at established sites during established times. Conditions can be recorded by a trained observer. Documentation can include visual air

quality conditions (haze, dust) and odors (diesel buses, trucks; cars) related to campfires and motor vehicles. The degree of impact can be recorded as high, medium, or low, or another relative scale can be used.

Quantitative measurements can be made of particulate matter, carbon monoxide and nitrous oxides using air quality monitoring equipment. The number of campfires and vehicles in an area can be counted in visitor facilities such as roads, campgrounds, and parking lots to compute pollutant emissions.

### **Aquatic Resources**

Water quality in the park is protected by the Clean Water Act. Several aspects of water and aquatic resources can be used to indicate and track aquatic resource conditions (e.g., compliance with designated water quality standards that are established to protect aquatic life communities and park visitor health) that may be affected by point and non-point discharges from developed and non-developed areas.

Recreational use can affect water nutrient concentrations, aquatic plant production, and fish populations through activities conducted along the banks of park streams and lakes. These activities can affect dissolved oxygen content of water; bacterial concentrations and types; suspended matter content; and water turbidity. Compaction of shoreline soils and trampling of vegetation from recreational use and trail maintenance practices can alter habitat for amphibians and benthic organisms.

Qualitative and quantitative measurement methods can be used as indicators to track changes. Qualitative approaches can include estimating the number of signs of human waste (e.g., toilet paper flowers) and documenting instances of offensive odors from human waste, signs of fish wastes in water left by anglers, relative amount of shoreline trampled with compacted soils, and relative amount of sedimentation or water turbidity.

Quantitative approaches can include making direct measurement of fecal contamination in snow within a lake's watershed (e.g., winter use of areas such as Reflection Lake); measuring coliform and other enteric organisms in lakes and streams heavily visited by recreational users; quantifying amount of human waste removed from areas of concern (e.g., Camp Muir and Schurman, wilderness camps); and measuring relative

transparency of lake or pond (measured by using a Secchi disk).

Concentrations of nutrients, inorganic ions, and other water quality parameters can be measured using a wide array of measurement equipment (e.g., transparency using a light meter, turbidity, specific conductance, dissolved oxygen, pH, alkalinity, and aquatic species composition). Candidate park areas where monitoring could be applied first, include sensitive resource and recreation zones (Reflection, Tipsoo, Shadow); wilderness transition trail, and semi-primitive trail zones (all sites with lake or stream destination).

### **Noise**

The National Park Service Director's Order 47, "Soundscape Preservation and Noise Management (NPS 2000e) directs park managers to protect natural sounds and to allow visitors the opportunity to hear the sounds of nature with a minimum of human-induced noise intrusions. As visitor uses increase and the use of transportation in, around, and above the park increases, the preservation of natural sounds becomes more difficult. Major noise sources include private vehicles, commercial vehicles, aircraft, blasting for avalanche control or trail maintenance and construction; and sounds of large numbers of people talking. Noise also affects wildlife. Research shows that birds, mammals, insects and amphibians may experience reproductive losses, habitat avoidance or abandonment and injury when noise interferes with normal behavior and the ability to communicate or detect danger.

Information collected with acoustical monitoring and recording equipment can be used to indicate increases in noise levels in wilderness and nonwilderness visitor areas compared to unvisited reference areas (natural ambient soundscapes). Changes in noise levels can be measured to monitor trends in sensitive areas. Correlations can be established between measured noise levels and visitor responses.

To monitor noise effects on park visitors, visitor surveys could be administered to look at visitors' psychological response to noise and changes to the ambient soundscape. This approach assumes that noise exposure affects visitors' well-being and highly variability noise levels disturbs individual more than a constant noise level. Visitor surveys on

noise intrusions could be first applied in sensitive resource and recreation areas, near visitor facilities, and along major roadway at popular visitor facilities and attractions. Results of the visitor surveys could be compared to ongoing acoustical monitoring of the various park natural ambient soundscapes and noise intrusions to determine if management actions were necessary to correct diminished visitor experiences.

### **Wildlife (Food-Habituation)**

The incidence and extent of changes in wildlife behavior can be used to indicate effects of visitors on some wildlife species. Visitors offering food to animals that accept handouts and eventually come to expect offerings from all visitors is an obvious animal behavior change from normal patterns. The presence of wildlife (primarily rodents and bird species of the crow and jay families) that have grown accustomed to receiving food handouts from visitors by foraging at popular visitor areas, campsites, and campgrounds indicates that they have altered their normal foraging behavior. Besides creating the potential for negative consequences to the animal, this behavior leads to increased threats to public safety from animal bites and from the transmission of wildlife-borne diseases. Monitoring of such behavior can occur primarily at more heavily visited developed areas (picnic areas, rest stops along trails, parking lots, roadside pullouts) and secondarily at nonwilderness campgrounds and designated wilderness campsites.

Characteristics that can be measured or estimated include the number of feeding incidents observed per unit time, number of food offering incidents by visitors, evidence of food-begging behavior of animals, and number and species of animals approaching people in campgrounds and campsites.

### **Wildlife (Highway Mortality)**

The number, type, and rate of wildlife deaths resulting from automobile collisions on park roads can indicate effects to wildlife populations from increased visitor uses of the park or in popular areas. Traffic volume, speed, and timing, land use along the road, terrain features, and wildlife abundance are primary factors that determine the degree of wildlife mortality caused by automobile collisions. In general, greater numbers of wildlife perish due to collisions with vehicles as the number of vehicles increases, as the speed of traffic increases, and when those vehicles travel during peak

animal activity periods (e.g., dusk and dawn, during migration periods). Therefore, as the number of vehicle trips in the park increases, wildlife mortality along roads can be expected to increase. Measurements can be made along road corridors throughout the park but should be focused in areas that have a history of frequent and constant wildlife collisions.

Measured parameters can include the number of roadkills per mile of road, physical locations of roadkills, species and numbers of wildlife lost. Wildlife mortality quantities and trends can be estimated by driving roads with recognized high wildlife mortality rates at different times during the day, stopping at carcasses to identify what died, and estimating the approximate time of death.

### **Wildlife (Human Incidents)**

The number and types of encounters between potentially dangerous wildlife and humans is another useful indicator of visitor effects on some wildlife species. Encounter numbers and rates may increase if visitation increases. The likelihood that some of these encounters would involve injury to park visitors also rises. The numbers of sightings of mountain lions and black bears seems to be on the rise, as evidenced by the numbers of wildlife observations being reported by visitors. Tracking can focus on encounters between bears and mountain lions in both nonwilderness and wilderness areas,

especially at campgrounds and picnic areas, along trails, and at wilderness campsites.

The numbers of observations, encounters, and dangerous incidents between humans and mountain lions and black bears can be tabulated and analyzed to identify problem areas and historical trends. Measurement indicators can include wildlife-human incidents reported to rangers and interpreters by park visitors and staff.

### **Trails**

Trail standards are well defined in the *Wilderness Management Plan* (NPS 1992c) and the "Trail Management Handbook" (NPS 1989c). Data on trails could be obtained using either aerial photographs or conducting on-site surveys. Width of trails can be measured at regular or random intervals and measurements could be averaged and multiplied by trail length to derive the area affected. Current wilderness standards are for trails no wider than 18 inches. Additional standards could be developed for density of trails by number, length and total area. This would put a limit on the number of social trails accepted (wilderness standards allow for no social trails in all zones). Additional changes to trails can be measured, including trail depth, gully formation, extent of erosion, number of switchbacks, and number of parallel trails.

## APPENDIX E: ANALYSIS OF BOUNDARY ADJUSTMENT AND LAND PROTECTION CRITERIA

As one of the provisions of Public Law 95-625, the National Park and Recreation Act of 1978, Congress directed that the National Park Service consider, as part of a planning process, what modifications of external boundaries might be necessary to carry out park purposes. Subsequent to this act, Congress also passed Public Law 101-628, the Arizona Desert Wilderness Act. Section 1216 of this act directs the Secretary of the Interior to develop criteria to evaluate any proposed changes to the existing boundaries of individual park units. Section 1217 of the act calls for the National Park Service to consult with affected agencies and others regarding a proposed boundary change, and to provide a cost estimate of acquisition cost, if any, related to the boundary adjustment.

These legislative provisions are implemented through NPS *Management Policies*, which state that the National Park Service will conduct studies of potential boundary adjustments and may make boundary revisions:

- to include significant resources or opportunities for public enjoyment related to the purposes of the park
- to address operational and management issues
- to improve identification by topographic or other natural features
- to protect park resources critical to fulfilling park purposes

NPS policies and special directive 92-11 instruct that any recommendation to expand park boundaries be preceded by determinations that the added lands will be feasible to administer considering size, configuration, ownership, cost and other factors, and that other alternatives for management and resource protection have been considered and are not adequate.

The following is a review of the criteria for boundary adjustments as applied to Mount Rainier National Park. This review is included as supporting documentation for the alternatives 2-and 3, which includes a recommendation for a boundary

change along the Carbon River corridor contiguous with the Northwest quadrant of the park.

This plan does not address the legislative requirement to provide a cost estimate for the boundary adjustment. However, the legislative proposal for the boundary adjustment and accompanying support materials would include a cost estimate.

### **BOUNDARY CHANGE PROPOSAL, CARBON RIVER CORRIDOR**

The proposed boundary change would seek congressional authorization for an addition of approximately 1,063 acres to Mount Rainier National Park. Also recommended would be an accompanying authorization to appropriate funds to the National Park Service from the Land and Water Conservation Fund to immediately purchase, on a willing seller basis, 210 acres within the revised boundary for purposes of developing a new vehicular accessible campground and administrative area along the Carbon River.

### **Significant Resources or Opportunities for Public Enjoyment Related to the Purpose of Mount Rainier National Park**

The boundary modification would allow the National Park Service to provide both enhanced and replacement vehicular accessible campground for the public along a scenic and protected section of the Carbon River immediately west of the current park entrance. This new campground would be in addition to the existing Ipsut Creek campground, which would be converted to a facility that would be accessible only by foot or nonmotorized vehicle. It is anticipated that a future naturally occurring flood event will permanently preclude motorized vehicle access to the Ipsut Creek campground located some 5 miles up the Carbon River Valley from the current entrance. The Ipsut Creek campground would then be converted to a walk-in campground. Therefore, this boundary change will enable the development of a new campground within the Carbon River, in turn providing more recreational opportunities to the public. Its development will also help to mitigate the loss of recreational use caused by the anticipated future closure of the Ipsut Creek campground to vehicular access.

### **Operational and Management Issues Related to Access and Boundary Identification by Topographic or Other Natural Features**

The proposed boundary change would follow a dedicated county road on the south and an established section line on the north side of the Carbon River on the north. The proposed boundary is contiguous with the existing park boundary on the east. On the west, multiple ownerships and the west side of the county road right-of-way would frame the western boundary north of Carbon River Road. Given these features and topography, the National Park Service will be able to easily identify and mark the amended boundary of the park. The proposed boundary also allows the National Park Service to move certain administrative facilities from the current park entrance, which are in a floodplain, to an area within the proposed new campground site that is not in a floodplain.

### **Protection of Park Resources and Fulfillment of Park Purpose**

The proposed boundary change would protect additional areas along the Carbon River corridor directly adjacent to the park. This includes the protection of both scenic and natural resources, and includes protection of the road corridor entering the park from the west, and protection of the Carbon River and its environs. Portions of the proposed addition also contain designated critical habitat for marbled murrelets a threatened species.

The addition of about 1,063 acres to Mount Rainier National Park also would provide additional public recreation opportunities that are not currently present, including a new vehicular accessible campground, sites for group camping, additional miles of non-motorized hiking trails, and additional accessible riverbank fishing, and an appropriate southeast terminus of the foothills trail.

### **Feasibility to Administer the Lands Added through Boundary Adjustment**

The proposed addition is very feasible for the National Park Service to manage. Alternatives 2 and 3 both include a permanent visitor contact facility (welcome center) in the nearby community of Wilkeson. This would include resource

protection and interpretive staff that would be available to strategically serve the proposed approximate 1,063-acre boundary addition, as well as the Carbon River/Mowich areas of the park. Also, the proposed campground site offers opportunities for the siting of certain administrative/ maintenance facilities, which would enhance on-site capabilities for staff to meet varying situations within the Carbon River/Mowich area of the park.

### **Protection Alternatives Considered**

Regarding the proposed campground area, other locations were considered, but rejected. This is the closest large area to the existing park boundary that is conducive to camping that is outside of the floodplain of the Carbon River. A willing seller is involved in the proposed acquisition of the site. Regarding other lands within the proposed boundary addition, one parcel is a proposed land donation to the National Park Service by a non-profit entity. Other lands with the proposed boundary addition can either be managed by the National Park Service or by the Mount Baker-Snoqualmie National Forest. In any event, an addition to the park boundary affords the best opportunity to provide for future public recreational use of the area, along with the protection of important scenic and natural resources within a National Park setting.

### **Proposed Additions to the Mount Rainier National Park Boundary and Other Adjustments**

Under the preferred alternative, about 1,063 acres are proposed for inclusion within the boundaries of Mount Rainier National Park. Congressional action would be required to authorize this change, and authorize and appropriate the funds from the Land and Water Conservation Fund, which would be necessary to acquire interests in private lands from willing sellers. About 14 parcels of private lands would need to be acquired within the proposed boundary change. Some land within the proposed boundary change is currently managed by the Mount Baker-Snoqualmie National Forest. These lands could either be administratively transferred to the National Park Service or retained as part of the National Forest.

## APPENDIX F: LETTER OF CONSULTATION



### United States Department of the Interior

#### FISH AND WILDLIFE SERVICE

Western Washington Office  
510 Desmond Drive SE, Suite 102  
Lacey, Washington 98503  
Phone: (360) 753-9440 Fax: (360) 534-9331

**MAR 14 2001**

Dear Species List Requester:

You have requested a list of listed and proposed threatened and endangered species, candidate species and species of concern (Attachment A) that may be present within the area of your proposed project. This response fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act of 1973, as amended (Act). We have also enclosed a copy of the requirements for Federal agency compliance under the Act (Attachment B).

Should the Federal agency determine that a listed species is likely to be affected (adversely or beneficially) by the project, you should request section 7 consultation through this office. If the Federal agency determines that the proposed action is "not likely to adversely affect" a listed species, you should request Service concurrence with that determination through the informal consultation process. Even if there is a "no effect" situation, we would appreciate receiving a copy for our information.

Species of concern are those species whose conservation standing is of concern to the Service, but for which further status information is still needed. Conservation measures for species of concern are voluntary, but recommended. Protection provided to these species now may preclude possible listing in the future.

There may be other federally listed species that may occur in the vicinity of your project which are under the jurisdiction of the National Marine Fisheries Service (NMFS). Please contact NMFS at (360) 753-9530 to request a species list.

In addition, please be advised that federal and state regulations may require permits in areas where wetlands are identified. You should contact the Seattle District of the U.S. Army Corps of Engineers for Federal permit requirements and the Washington State Department of Ecology for State permit requirements.

Your interest in endangered species is appreciated. If you have additional questions regarding your responsibilities under the Act, please contact Yvonne Dettlaff (360) 753-9582 or Bobbi Barrera (360) 753-6048.

Sincerely,

A handwritten signature in black ink, appearing to read "Carol Schuler". The signature is fluid and cursive, with a small "for" written below the main name.

Carol Schuler, Acting Manager  
Western Washington Office

Enclosure(s)

cc: WDFW Region 4

ATTACHMENT A

March 9, 2001

**LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES,  
CANDIDATE SPECIES AND SPECIES OF CONCERN  
WHICH MAY OCCUR WITHIN THE VICINITY OF THE  
MOUNT RAINIER NATIONAL PARK GENERAL MANAGEMENT PLAN PROJECT  
IN PIERCE AND LEWIS COUNTY, WASHINGTON**

**(T15N R09E S01-10; T16N R08E; T16N R09E; T17N R08E S13-14,17-23,32-35)**

**FWS REF: 1-3-01-SP-0564**

**LISTED**

Bald eagle (*Haliaeetus leucocephalus*) - wintering bald eagles may occur in the vicinity of the project. Wintering activities occur from October 31 through March 31

Bull trout (*Salvelinus confluentus*) - occur in the vicinity of the project.

Canada lynx (*Lynx canadensis*) - may occur in the vicinity of the project.

Gray wolf (*Canis lupus*) - may occur in the vicinity of the project.

Grizzly bear (*Ursus arctos* = *U a horribilis*) - may occur in the vicinity of the project area.

Marbled murrelet (*Brachyramphus marmoratus*) - occur in the vicinity of the project. Nesting activities occur from April 1 through September 15.

Northern spotted owl (*Strix occidentalis caurina*) - occur in the vicinity of the project. Nesting activities occur from March 1 through September 30.

Major concerns that should be addressed in your biological assessment of the project impacts to listed species are:

1. Level of use of the project area by listed species.
2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.
3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) which may result in disturbance to listed species and/or their avoidance of the project area.

**PROPOSED**

None

**CANDIDATE**

None.

**SPECIES OF CONCERN**

The following species of concern may occur in the vicinity of the project:

California wolverine (*Gulo gulo luteus*)  
Cascades frog (*Rana cascadae*)  
Fringed myotis (bat) (*Myotis thysanodes*)  
Long-eared myotis (*Myotis evotis*)  
Long-legged myotis (*Myotis volans*)  
Northern goshawk (*Accipiter gentilis*)  
Olive-sided flycatcher (*Contopus cooperi*)  
Pacific lamprey (*Lampetra tridentata*)  
Peregrine falcon (*Falco peregrinus*)  
River lamprey (*Lampetra ayresi*)  
Van Dyke's salamander (*Plethodon vandykei*)  
Western toad (*Bufo boreas*)



## PHONE MESSAGE

United States Department of the Interior / National Park Service / Denver Service Center  
 12795 West Alameda Parkway / P.O. Box 25287 / DSC-PM / Denver, CO 80225-0287

**Project:** MORA GMP

**Date:** February 10, 2000

**NPS Package No.:** 2001-A134-409

**Time:**

**FHWA Package No.:**

**Call To/From:** Thomas Hooper, Fish Biologist, National Marine Fisheries Service, Lacey, WA

**Phone Number:** 360/753-9453

**Subject:** Threatened & Endangered Species in Mount Rainier

**Discussion:** On February 9, I called Tom to initiate section 7 informal consultation on the MORA GMP/EIS. (Although we had contacted the Fish and Wildlife Service to obtain a list of federally threatened and endangered species, we had not contacted the National Marine Fisheries Service.) Tom is the fish biologist responsible for covering Pierce County. He told me that the Puget Sound chinook salmon population is listed as threatened and that the salmon probably occurs in all of the major drainages in Mount Rainier, including the Puyallup and Nisqually drainages. (Even if the fish does not occur in some drainages, any changes in the headwaters of these drainages could affect salmon populations downstream of the park.) Thus, we need to make a determination (biological opinion) in the EIS whether or not our actions in the GMP would affect the salmon.

Tom noted that we do not have to send them a letter requesting a species list, since I called him. However, his office will want to review the GMP and our finding

**Followup Tasks:** We need to include the salmon in the description of threatened species in the Affected Environment

We need to include chinook salmon in the analysis of impacts in the Environmental Consequences section. (I don't expect that we're doing anything to affect water quality or quantity as a result of the GMP, but we need to state this and explain why.)

We also need to make sure that the National Marine Fisheries Service is on our mailing list to get the draft GMP, and we probably will want to send them sections of the draft in the internal review period to get their concurrence with our finding.

We also need to include this phone log in the appendix of the document as a record that we contacted NMFS, since we don't have a formal letter from them.

We can send the draft to Tom Hooper. His address is NMFS, 510 Desmond Dr., SE, Suite 103, Lacey, WA 98503. His e-mail address is [thomas.hooper@noaa.gov](mailto:thomas.hooper@noaa.gov)

<b>Copies to:</b>	<input type="checkbox"/> TIC	<input type="checkbox"/> with attachment	<input type="checkbox"/> by mail
	<input checked="" type="checkbox"/> PIFS	<input type="checkbox"/> without attachment	<input type="checkbox"/> by NPS mail system
	<input checked="" type="checkbox"/> Project Files	<input type="checkbox"/> by fax	<input type="checkbox"/> by electronic mail

**By:**

*Project Manager:* Larry Beal

*Telephone No.:* 303/969-2454

**APPENDIX G: DRAFT STATEMENT OF FINDINGS FOR THE GENERAL  
MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT  
MOUNT RAINIER NATIONAL PARK**

**RECOMMENDED:** \_\_\_\_\_

**SUPERINTENDENT**

**DATE**

**MOUNT RAINIER NATIONAL PARK**

**CONCURRED:** \_\_\_\_\_

**CHIEF, WATER RESOURCES DIVISION**

**DATE**

**CONCURRED:** \_\_\_\_\_

**DIRECTOR, WESTERN REGION**

**DATE**

## INTRODUCTION

It is NPS policy to preserve floodplain values and to minimize potentially hazardous conditions associated with flooding. (In this regard, floods can be clear-water floods, mudflows, or debris flows.) NPS developments in floodplains are subject to compliance with Executive Order 11988 as specified by the National Park Service's (1993b) *Floodplain Management Guideline* (Guideline).

According to the Guideline, various Park Service actions are classified as fitting into one of three "action classes" depending upon the type of activity and the nature of flooding at the proposed or existing site. NPS policy is to avoid the use of a floodplain of specific recurrence interval associated with each of the three action classes (regulatory floodplain), whenever there is a practical alternative. For Class I actions, the base floodplain (100-year) is the regulatory floodplain; for Class II actions, the 500-year return period floodplain is the regulatory floodplain; for Class III actions, the extreme floodplain is the regulatory floodplain. Class I actions include most NPS developments in non-high hazard settings (defined below). Class II actions are so-called critical actions, i.e., those actions that require a higher degree of protection such as schools, museums, and large fuel storage facilities. Class III actions are class I or II actions that are located in high hazard areas — areas where dangerous flooding can occur without warning.

Where there is a compelling reason for Park Service facilities to occupy a regulatory floodplain, NPS policy permits the activity when a statement of findings (SOF) is prepared that explains the rationale for use of the floodplain, discloses the risk from flooding, and discusses how mitigation of the risk can be achieved. The statement of findings process applies to all new facilities and to existing facilities when park planning is being performed. In the case of existing facilities not in compliance with the Guideline, the planning document is to identify those areas potentially or known to be out of compliance and to define a course of action to be taken over a reasonable amount of time to bring these developments into compliance with the Guideline. Immediate rectification of all problem locations may not be possible, however, consideration in the plan should be given to long-term solutions, such as relocation, and short-term

actions that can be taken to reduce flood risk to lower levels.

As shown in the Geologic Hazards map and table 11 in the general management plan, many of the developed sites within Mount Rainier National Park are in areas at risk from debris flows that may occur at any time of year, some without warning. Specifically, seven sites — Longmire, White River campground, Cougar Rock campground, Ipsut Creek campground, Kautz Creek, Westside Road, and the Box Canyon picnic area — are in Case III debris flow zones. These are areas that are subject to destructive debris flows on an average recurrence interval of one event every 100 years. Seven other sites are in Case II debris flow zones (Sunshine Point campground, Ohanapeosh, Nisqually entrance, the Stevens Canyon area, White River entrance, Carbon River entrance, and Falls Creek picnic area), which are inundated on an average recurrence interval of 100 to 500 years. Tahoma Woods, Camp Muir/Camp Schurman, and the Nahunta Falls picnic area are in Case I debris flow zones, which are inundated on an average recurrence interval of 500 to 1,000 years. Debris flows are triggered by a number of processes, including avalanches of hydrothermally altered rocks, volcanic activity, and glacial outburst floods — massive, sudden releases of water from a glacier. In general, outburst floods and debris flows are far more destructive than water-dominated floods. They can occur rapidly on either sunny or rain days, with little warning. For example, debris flows from the summit of Mount Rainier could arrive in the Cougar Rock and White River campgrounds between 6 and 22 minutes. (For more information on the flooding characteristics and volcanic hazards of these areas, see NPS 1997b, Hoblitt et al 1998, and the "Affected Environment" chapter of this general management plan.)

## JUSTIFICATION FOR RETAINING FACILITIES IN THE FLOODPLAIN

Under preferred alternative all of the above facilities would be retained for their existing uses, with the exception of the Carbon River entrance administrative facilities (which would be relocated to the proposed boundary adjustment) and the Ipsut Creek campground (which would be converted to a walk-in only campground if and when the road is closed to private vehicles). The decision was made not to move the facilities for several reasons. Mount Rainier National Park is dominated by an active volcano. All of the mountain's valleys are subject to the risk of outburst floods and debris flows. Further, there are very few flat

areas in the park where developments could be located near popular attractions with no or minimal risk from these events. (And even if there were such areas, they would still be at risk from other volcanic activity, including pyroclastic flows, lateral blasts, lava flows, tephra falls, and landslides.)

Furthermore, although there are areas of the park that are susceptible to less geologic hazard than some of the existing development locations, moving facilities is costly and would cause new environmental impacts and concerns. The process of identifying and moving to new and less hazardous locations is beyond the scope of this general management planning effort. However, the decision to retain existing facilities and functions in their present locations is not a permanent decision but one intended to permit time for further analysis of alternatives and relative risks associated with the alternatives. In the interim period, several actions will be taken to reduce risk (see below).

Finally, the public has expressed an unwillingness to move several of the visitor facilities. At public meetings held in 1997, most people said they preferred to make their own decisions about whether or not to camp or participate in other activities in areas where the risk for geological hazards is high.

### DESCRIPTION OF THE FLOOD RISK

It is certain that some time in the future there will be another outburst flood/debris flow in Mount Rainier National Park, although it is not possible to predict when the event will occur. When an outburst flood or debris flow occurs in the park, depending on the time, season, and location of the event, there could be a major loss of life and property. As noted in the "Environmental Consequences" chapter of the general management plan, risk to public safety in the long-term would range from minor to major, depending upon a site's location. Major, long-term risks would continue under the preferred alternative in areas such as Longmire, Cougar Rock, and the White River campground because of their location in debris flow inundation zones. The White River campground in particular would continue to be at high risk due to its proximity to the mountain, its location on the valley floor, and the large mass of fractured, hydrothermally altered rock on Little Tahoma Peak.

Little or no warning time will be available for evacuation in any of these areas and conditions during a flood event could be devastating. Additionally, water quality impacts are likely during very large floods associated with the fuel storage facilities at Longmire.

### ACTIONS TO MINIMIZE RISK TO LIFE OR PROPERTY

To mitigate the risk to life and property, information has been posted at campgrounds, inns, and visitor centers on the geologic hazard/flood risk and on evacuation and escape routes. Information on geologic hazards also is posted on the park's Website ([www.nps.gov/mora/general/safety.htm](http://www.nps.gov/mora/general/safety.htm)), and the hazard is pointed out in the park's official brochure and newsletter (*The Tahoma News*). It is noted that the longer one stays in these areas, the greater the chances the individual could be involved in an event, that visitors may have insufficient warning to safely leave an area should an event occur, and that each individual needs to decide if he or she will assume the personal risk of visiting and staying overnight in these potentially dangerous locations. Work also is continuing on completing an evacuation plan and a park/regional emergency response plan in cooperation with federal, state, county, and local emergency response organizations.

The preferred alternative in the general management plan calls for several more steps to reduce the risks to life and property. Additional efforts would be taken to educate and inform visitors and employees about the threat of geologic hazards and what to do if a debris flow occurs. The preferred alternative also states that new park facilities would not be built (and existing facilities would not be expanded) in high hazard areas, such as the White River valley floor (including the White River campground), the Nisqually valley floor above Tahoma Woods (including Longmire and Cougar Rock campground), and the Muddy Fork of the Cowlitz River. In other potential hazard areas precautionary guidelines would be developed to direct future development. The National Park Service would look for opportunities to move administrative facilities, including employee housing, from the Carbon River and White River entrances. The National Park Service would also examine gradually relocating other employee housing in high hazard areas, including Longmire.

## **SUMMARY**

The National Park Service recognizes that there is a risk of maintaining many of the existing visitor and employee facilities at locations within Mount Rainier National Park, and that potentially there could be a major loss of life and property. However, the National Park Service has determined that there is currently no immediate, practicable alternative to maintaining park employee and visitor facilities, including campgrounds and inns, in areas at risk from outburst floods and debris flows. This determination was based on the lack of “safe” areas in the nonwilderness portion of the park; the high environmental cost of moving facilities; and public comments indicating a willingness to accept an informed level of risk. However, this determination is not a permanent decision to retain all existing facilities and functions in their present locations. With the additional knowledge gained in this general management planning process, it is well

understood that several developed areas within Mount Rainier exceed ordinary NPS standards for risks from geologic hazards. With this knowledge, park managers will continue to investigate alternatives for substantially reducing risk to humans, park structures, and cultural and natural resources, with the long-term goal of providing protection up to levels specified in the “Floodplain Management Guideline.” To reduce risk to the extent possible while continuing use of existing facilities the following actions are proposed. Park staff would continue to inform and educate people about the risk through a variety of means, and would continue to develop contingency evacuation plans. No new facilities would be built, and existing facilities would not be expanded, in high hazard areas. Employee and administrative facilities would be relocated from the White River and Carbon River entrances when possible. Other administrative facilities in high-risk areas, including Longmire, might be gradually relocated.

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